

Mini Power-Zone® Unit Substation Selection Tables

Three Phase

480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZ15T2F	FAL34040	QO360	24	8	40	C	ii
22.5	MPZ22T2F	FAL34070	QO380	24	8	60	C	ii
30	MPZ30T2F	FAL34090	QO3100	24	8	80	C	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2F	FAL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2F	FAL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2F	FAL34090	QOB3100	24	8	80	CC	iii

480 Volt Primary, Load Center Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZ15T2F25K	FAL34040	QO360	24	8	40	C	ii
22.5	MPZ22T2F25K	FAL34070	QO380	24	8	60	C	ii
30	MPZ30T2F25K	FAL34090	QO3100	24	8	80	C	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2F25K	FAL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2F25K	FAL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2F25K	FAL34090	QOB3100	24	8	80	CC	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 65 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2F65K	HJL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2F65K	HJL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2F65K	HJL34090	QOB3100	24	8	80	CC	iii

Three Phase with 316 Stainless Steel Enclosure

480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZ15T2FSS	FAL34040	QO360	24	8	40	C	ii
22.5	MPZ22T2FSS	FAL34070	QO380	24	8	60	C	ii
30	MPZ30T2FSS	FAL34090	QO3100	24	8	80	C	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2FSS	FAL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2FSS	FAL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2FSS	FAL34090	QOB3100	24	8	80	CC	iii

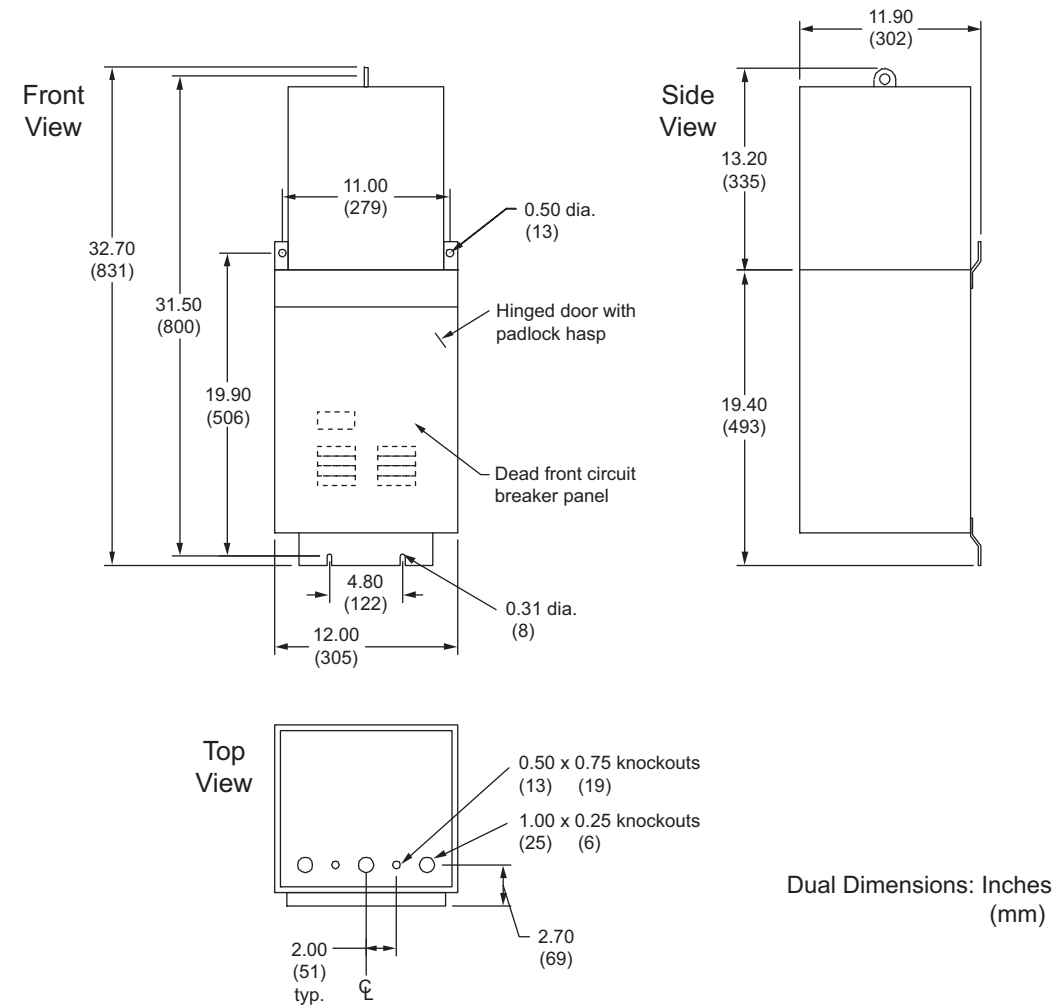
Made-to-Order Units

- Secondary voltages are always:
 - Single phase: 120/240
 - Three phase: 208Y/120
- Primary voltage options are:
 - Single Phase
 - 600 Volts
 - 240 Volts
 - 208 Volts
 - Three Phase
 - 600 Volts
 - 240 Volts
 - 208 Volts
- Transformer with electrostatic shielding
- Temperature rise 80°C on transformer
 - 5 to 15 kVA, single phase (not available on 25 kVA)
 - 15 to 22.5 kVA, three phase (not available on 30 kVA)
- Primary circuit breaker options
 - Shunt trip, 120 Volts
- Other packaged products available
 - Transformer combo available as floor mounted switchboards: 15 to 225 kVA; see the current edition of the Schneider Electric Digest

Mini Power-Zone® Unit Substation
Enclosure Drawings

Enclosure Drawings

Single Phase—Enclosure A

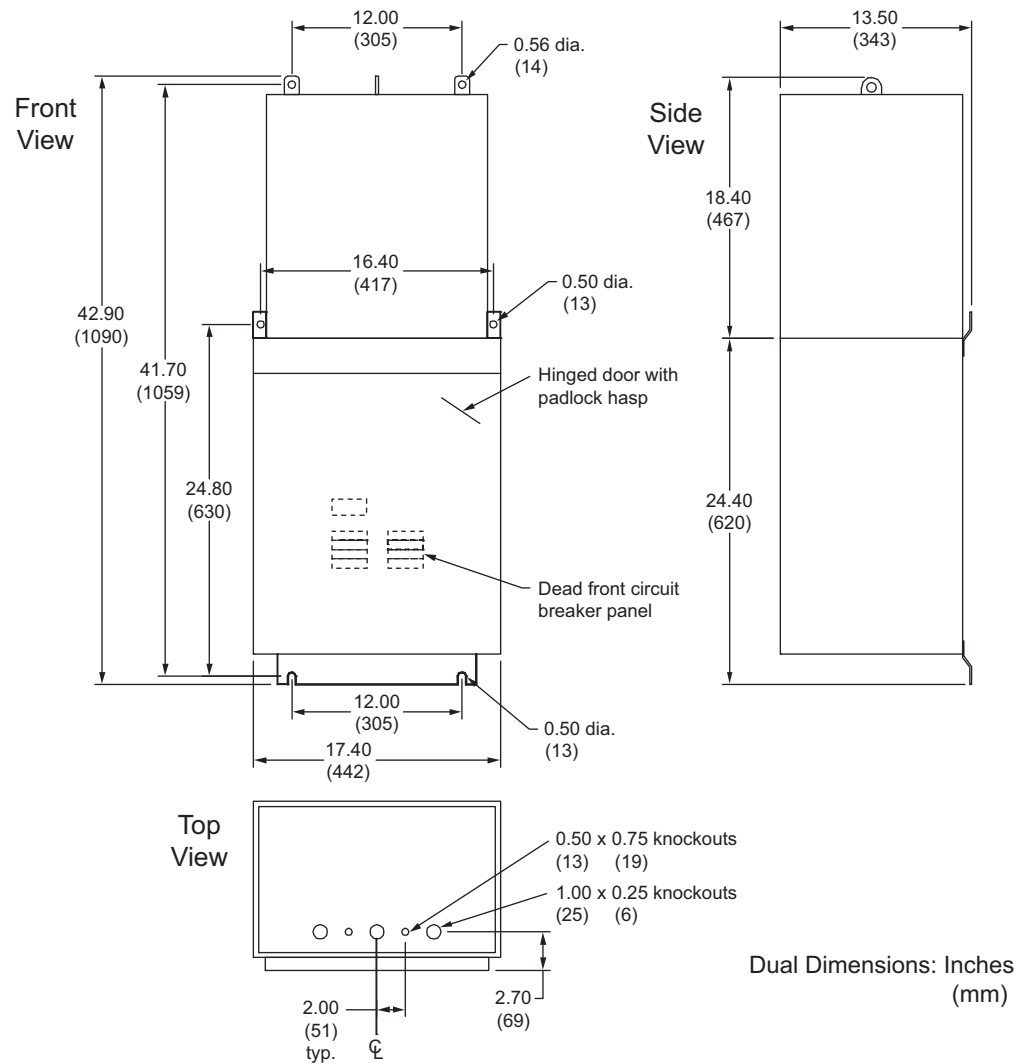


Replacement Parts

Item	Catalog Number
Box	39002-350-50
Dead front	39002-360-01
Hinged cover	39002-351-01
Back plate	39002-353-01
Ground bar	PK18GTA

Mini Power-Zone® Unit Substation Enclosure Drawings

Single Phase—Enclosure B

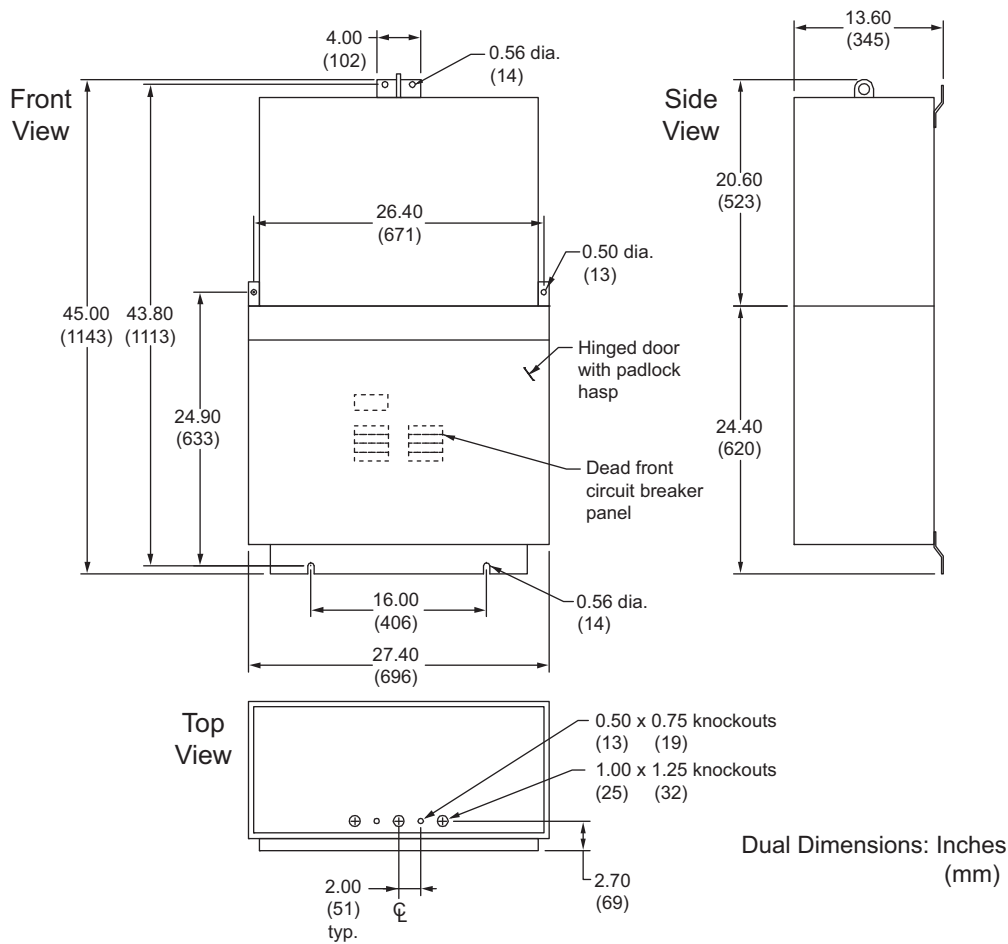


Replacement Parts

Item	Catalog Number
Box	39002-366-50
Dead front	39002-387-01
Hinged cover	39002-368-01
Back plate	39002-369-01
Ground bar	PK18GTA
Neutral assembly	SN-38

Mini Power-Zone® Unit Substation
Enclosure Drawings

Three Phase—Enclosure C

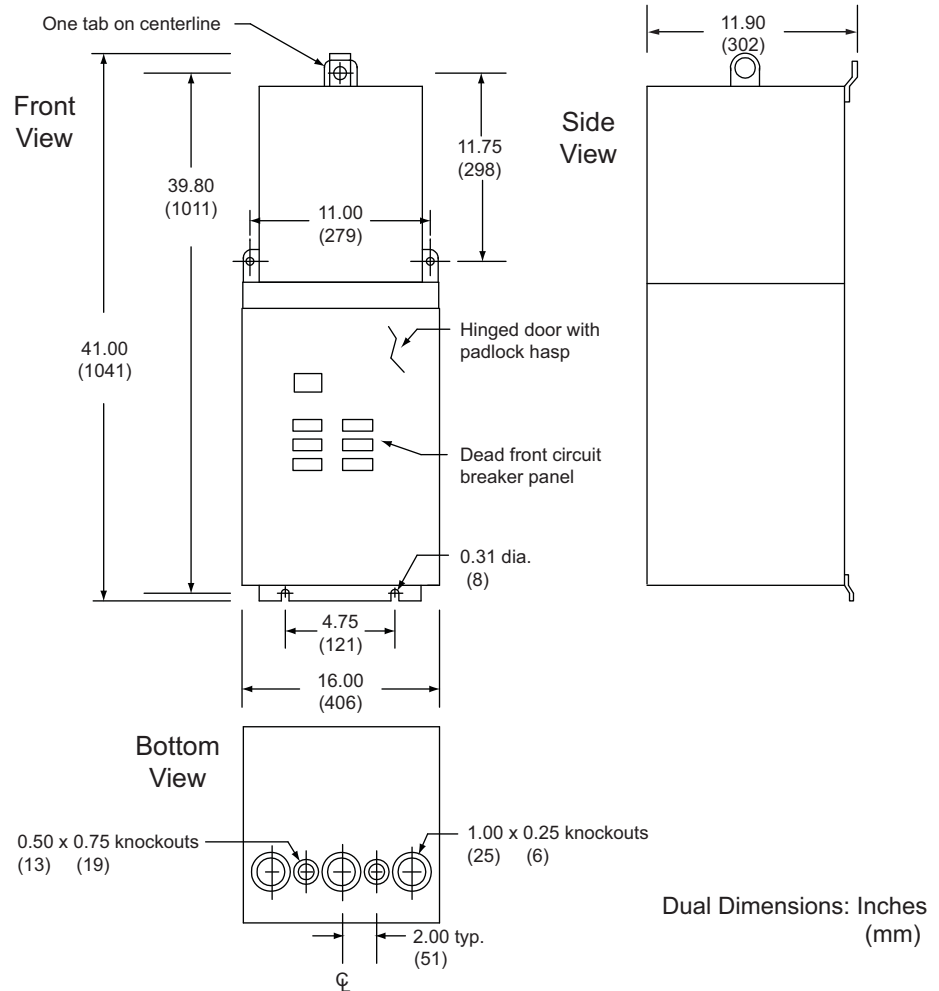


Replacement Parts

Item	Catalog Number
Box	39002-400-50
Dead front	39007-023-01
Hinged cover	39002-388-01
Back plate	39002-389-01
Ground bar	PK18GTA
Neutral assembly	SN-38

Mini Power-Zone® Unit Substation Enclosure Drawings

Single Phase—Enclosure AA

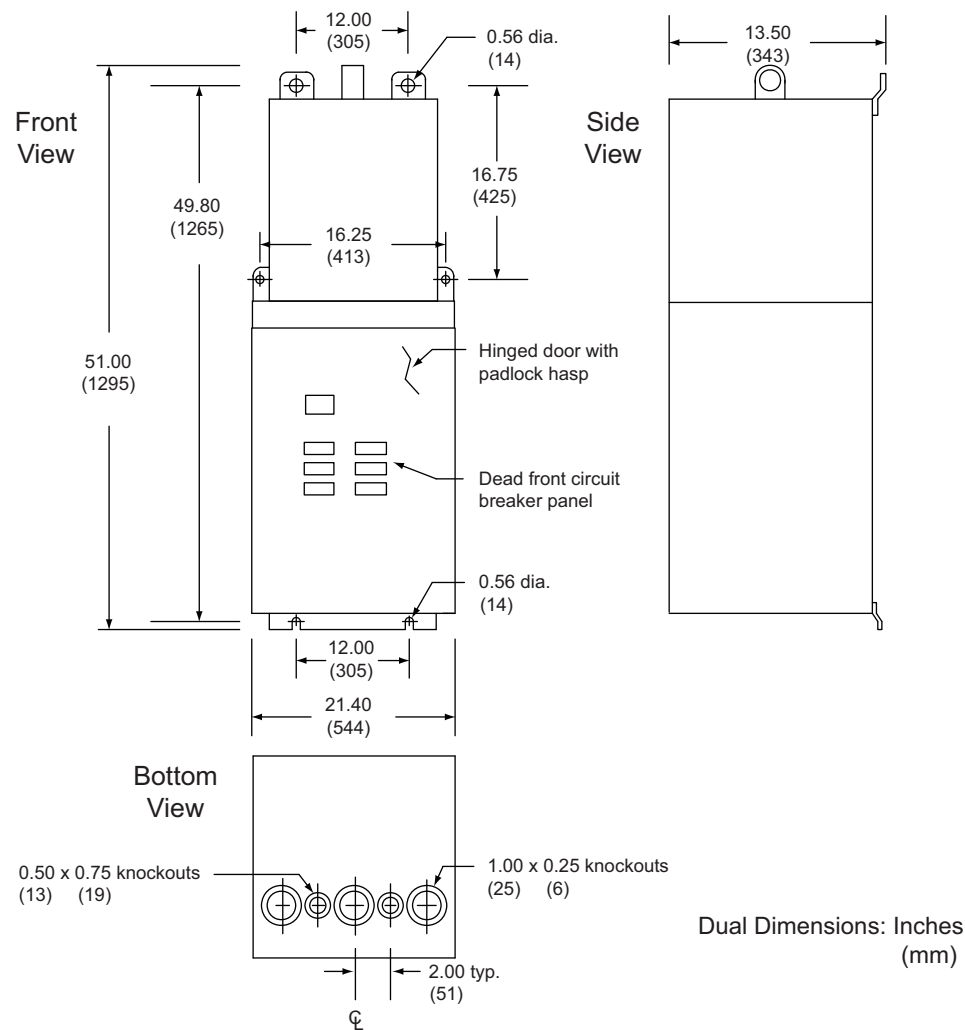


Replacement Parts

Item	Catalog Number
Box	39002-412-50
Dead front	39002-412-07
Hinged cover	39002-412-08
Back plate	39002-419-01
Ground bar	PK18GTA
Neutral assembly	SN-38

Mini Power-Zone® Unit Substation
Enclosure Drawings

Single Phase—Enclosure BB

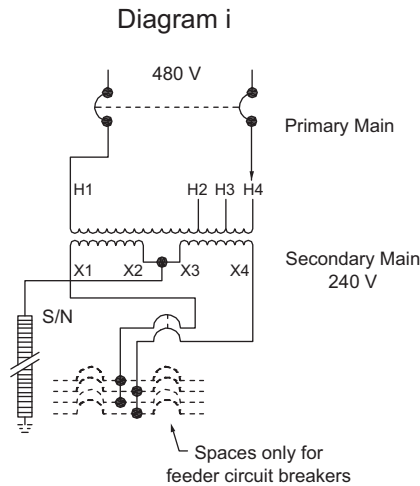


Replacement Parts

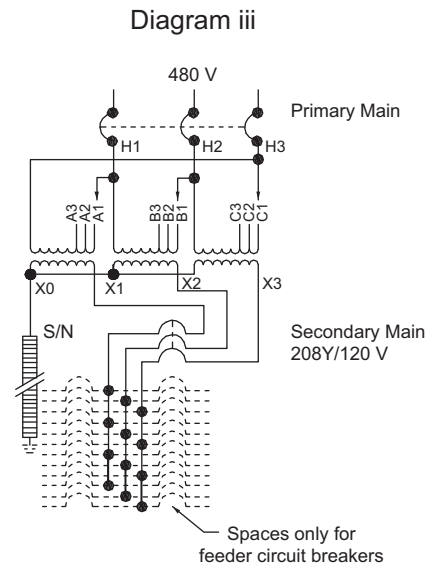
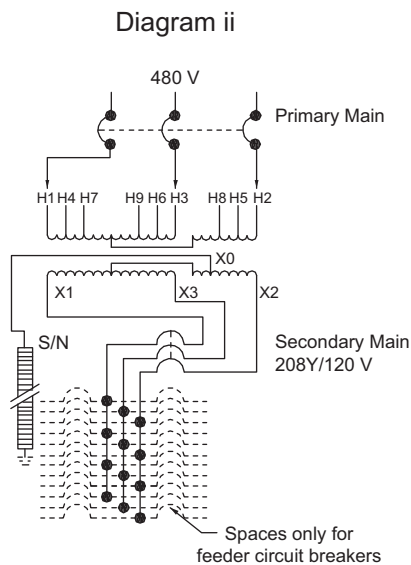
Item	Catalog Number
Box and back plate	39002-431-50
Dead front	39002-431-05
Hinged cover	39002-431-06
Ground bar	PK18GTA
Neutral assembly	SN-38

Wiring Diagrams

Single Phase



Three Phase



Additional Information

Designed for Ease of Installation

The Mini Power-Zone Unit Substation has a unique two-part construction that provides installation flexibility. This two-part construction uses removable transformers, available from factory stock, which can be replaced without disturbing external panelboard wiring. The transformer and panelboard can be mounted one part at a time if there is a space or handling problem.

The panelboard can be removed and wired first, if desired. The transformer simply mounts on top of the panelboard, and the primary and secondary leads are re-connected to the main circuit breakers.

All sizes are carried in Schneider Electric warehouse system stock. Each comes complete with the transformer and the main primary and secondary circuit breakers, all sized in accordance with NEC requirements. Branch circuit breakers are supplied separately.

Replacement Transformers and Interiors

Does not include backfeed secondary main circuit breaker

Phase	kVA	Catalog Number		
		Transformer	Interior	
			Load Center	Panelboard
1	5	MPT5S40F	QON30CCI	NQM18L1C
	7.5	MPT7S40F		
	10	MPT10S40F		
	15	MPT15S40F		NQM30L2C
	25	MPT25S40F		
3	15	MPT15T2F	QON330L200	NQM430L1C
	22.5	MPT22T2F		
	30	MPT30T2F		

Special Applications

Solar Photovoltaic Systems

- NEC 690.64 Point of Connection

The output of a photovoltaic (PV) utility interactive inverter can be connected to either the line or load side of the utility service, based on the system design and the requirements found in NEC 690.64. Mini Power-Zone units are ideal where voltage transformation is needed. The units include both primary and secondary overcurrent protective devices along with panelboard mounted devices for each inverter output.

Particular attention must be paid for load side connections and the requirements of NEC 690.64(B). If the panelboard in the Mini Power-Zone unit contains overcurrent protective devices for both PV inverter sources and system branch circuits or feeders, the sum of the ampere ratings of devices supplying power to the panelboard cannot exceed 120% of its ratings to comply with 690.64(B)(2). In addition, consider 690.64(B)(7), where the sum of the ampere ratings of devices supplying power exceeds the panelboard rating the devices used to connect PV inverters must be located at the opposite end from the input feeder or main circuit location. Since the panelboard devices are backfed from the PV inverters, hold down brackets are required to comply with 690.64(B)(6). Contact your local Schneider Electric representative for specific application assistance on using Mini Power-Zone units in PV systems.

Mini Power-Zone® Unit Substation

Product Specifications

- NEC 690.9 (B) Power Transformers

Must meet NEC 450.3 for overcurrent protection for primary protection.

Since the Mini Power-Zone unit will be used in both directions, the main circuit breakers must both comply with the secondary overcurrent protection limit of 125% maximum. That being the case, the limits for the primary circuit breakers at 480 V are as shown in the following table.

kVA	Phase	480 V Current	125% Handle Rating
5	1	10.42	15 ¹
7.5	1	15.63	20 ¹
10	1	20.83	30 ¹
15	1	31.25	40
25	1	50.08	70
15	3	18.04	25
22.5	3	27.06	35
30	3	36.08	50

¹ The standard single phase 5, 7.5, and 10 kVA circuit breakers comply with NEC 690.9 (B). Others will have to be quoted as special orders to meet the requirement.

Product Specifications

Unit Substations

UL Listed per UL 1062 File E92978

Transformers

Specification Number: 26 20 00.16

Product Name: DRY TYPE RESIN ENCAPSULATED TRANSFORMERS

Primary Overcurrent Protection (Circuit Breaker)

Specification Number: 26 28 16.14

Product Name: MOLDED CASE CIRCUIT BREAKERS

Secondary Panelboard and Secondary Main

Specification Number: 26 24 19.05

Product Name: LIGHTING AND APPLIANCE BRANCH CIRCUIT LOAD CENTERS

or

Specification Number: 26 24 16.14

Product Name: LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS 240 VAC, 48 VDC MAXIMUM

Schneider Electric

1010 Airpark Center Drive
Nashville, TN 37217 USA
1-888-Square D
1-888-778-2733
www.schneider-electric.us

7440CT0901 © 2009 Schneider Electric All Rights Reserved

09/2009

Attachment 10 - Transducer Operator's Manual

KPSI 700



- Submersible Level Transducer
- $\pm 1.00\%$ FSO Static Accuracy
- Custom Built in Two Days
- Two Year Warranty



DESCRIPTION

The KPSI 700 is a submersible hydrostatic level transducer specifically designed to meet the rigorous environments encountered in liquid level measurement and control. It can be configured to perform to specifications under most adverse, reactive conditions.

Every KPSI Transducer utilizes a highly accurate pressure sensor assembly specifically designed for hostile fluids and gases. The assembly is integrated with supporting electronics in a durable waterproof housing constructed of 316 stainless steel or titanium. The attached electrical cable is custom manufactured and includes para-aramid synthetic fiber members to prevent errors due to cable elongation, and a unique water block feature that self-seals in the event of accidental cuts to the cable. Each transducer is shipped with a SuperDry Vent Filter that prevents moisture from entering the vent tube for at least one year without maintenance, even in the most humid environments.

FEATURES

- Custom Polyurethane or ETFE Cable Lengths
- Welded 316SS or Titanium Body
- Custom Level Ranges up to 700 ft (210m) H₂O
- Multiple Analog Outputs
- Multiple Nose Piece Styles
- Optional Lifetime Lightning Protection
- Long Life Vent Filter or Aneroid Bellows

APPLICATIONS

- Lift Stations
- Pump Control
- Level Control
- Surface Water Monitoring
- Landfill Leachate
- Well Monitoring
- Groundwater Monitoring

SPECIFICATIONS

Parameter	Comment
LEVEL RANGES	
	2.3 thru 700 ft H ₂ O (0.70 thru 210 m H ₂ O)
	Vented Gage Reference
Full Scale Level Ranges (intermediate level ranges are available)	10 thru 700 ft H ₂ O (3 thru 210 m H ₂ O)
	Sealed Gage Reference
	35 thru 700 ft H ₂ O (10 thru 210 m H ₂ O)
	Absolute Gage Reference
Proof Pressure	1.5 x FS
Burst Pressure	2.0 x FS

KPSI 700

SPECIFICATIONS

STATIC PERFORMANCE

Static Accuracy (combined effects of non-linearity, hysteresis and repeatability, best fit straight line method)	±1.00% FSO	BFSL method
Resolution	+0.0001% FS	

ENVIRONMENTAL

Wetted Materials	316 SS or Titanium; POM; polyurethane or FKM	
Compensated Temp Range	0 to 50°C	
Thermal Error (maximum allowable deviation from the Best Fit Straight Line due to a change in temperature)	±0.05% FSO/°C ±0.1% FSO/°C	worst case over compensated temperature range for ranges < 12 ft (4 m) H ₂ O
Operating Temp Range	-20 to 60 °C	when attached to polyurethane cable
Protection Rating	IP 68, NEMA 6P	

ELECTRICAL

Excitation	9-28V – VDC output 9-28V – mA output 15-28V – VDC output 10-28V – VDC output	0-5V, 0-2.5V, 0-4V 4-20 0-10V 1.5-7.5V
Input Current	20 mA max 3.5 mA max	for mA output for VDC output
Output	4-20mA, 0-5 VDC, 0-2.5VDC, 0-4VDC, 0-10VDC, 1.5-7.5VDC	for ranges < 5 ft (1.5m) H ₂ O, only 4-20mA output is available
Zero Offset	±0.25 mA for mA output < 0.25 VDC for VDC output	
Output Impedance	See loop diagram for mA output 20 ohm for VDC output	
Insulation Resistance	100 mega ohm at 50 VDC	
Circuit Protection	Polarity, surge/shorted output	

CERTIFICATIONS

	CE compliant	EN 61326-1:2001 and 61326-2-3:2006
	UL, CUL and FM	Class I, II, III, Div 1, Groups A,B,C,D,E,F&G
	WEEE/RoHS	Waste from Electrical and Electronic Equipment (WEEE) and Restrictions on the use of Hazardous Substances (RoHS)

PHYSICAL

Approximate Weight	0.44 lbs (198 g) transducer 0.05 lbs/ft (79 g/m) cable	
Cable Jacket Material	Polyurethane (standard) ETFE (optional)	
Cable Pull Strength	200 lbs (90 kg)	Polyurethane
Cable Number of Conductors	4 Max	
Cable Conductor Size	22 AWG	
Cable Seal	Molded Polyurethane FKM Gland	for polyurethane cable for ETFE cable

TEMPERATURE OUTPUT OPTION (not intrinsically safety approved)

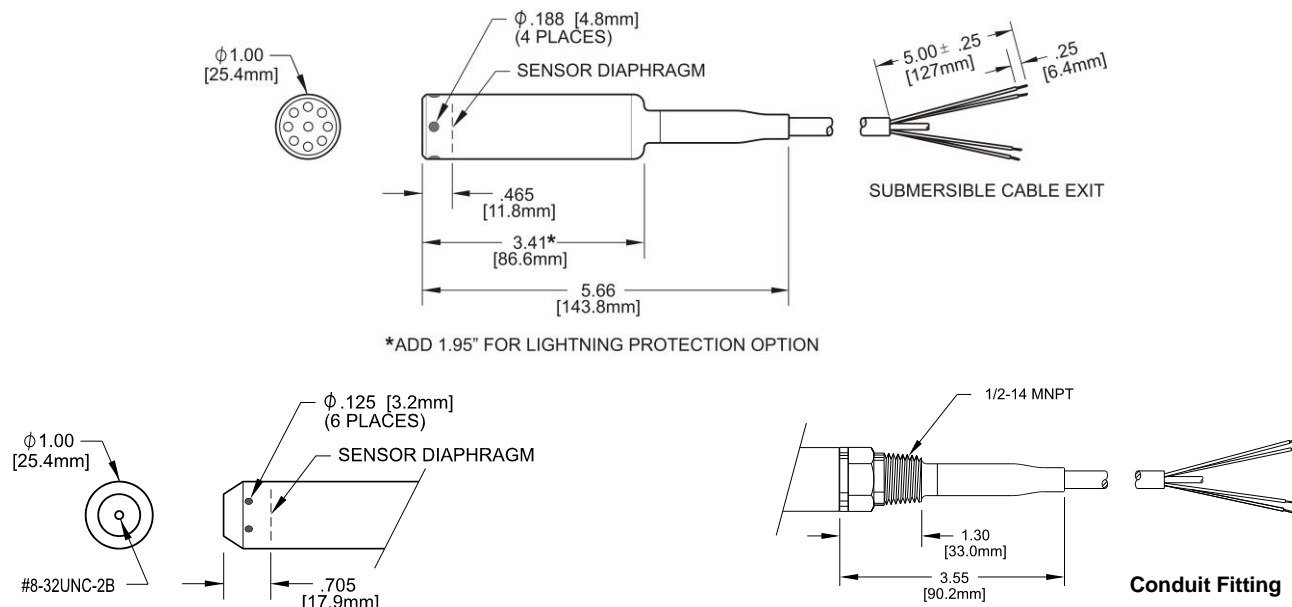
Temperature Range	-20 to 60°C	available for 4-20mA output versions only
Output Signal	4-20mA	
Temperature Measurement Accuracy	±4°C	±1°C with single point calibration

LIGHTNING PROTECTION (power supply needs to be limited to 150mA to avoid lock up of the gas tube after a suppression event)

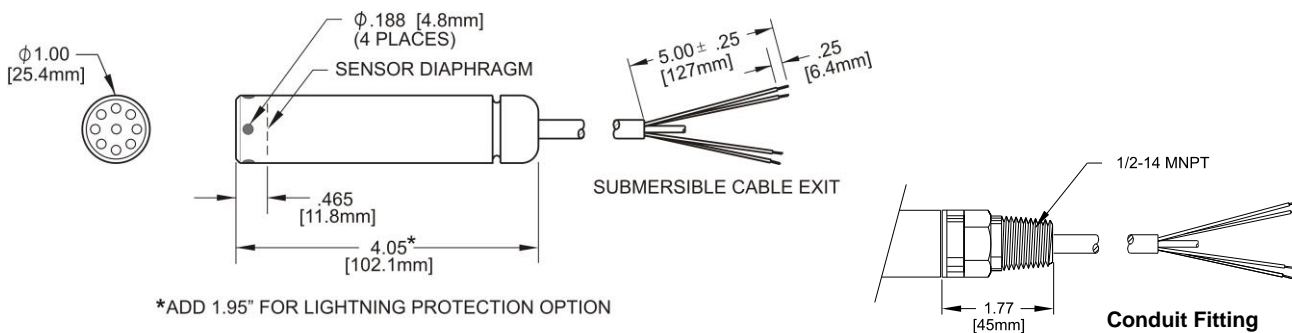
Life Expectancy	>1,000 Operations	
Peak Clamping Voltage	36 Volts	
Response Time	<10 nsecs	
Shunts	20,000 Amperes	

KPSI 700

DIMENSIONS



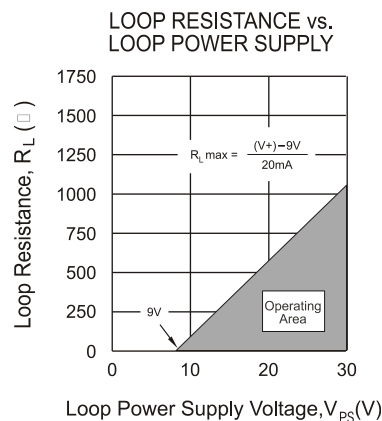
Molded Cable Seal Configuration for Polyurethane Cable



Gland Cable Seal Configuration for ETFE cable

ELECTRICAL TERMINATION / LOOP RESISTANCE / CERTIFICATIONS

ELECTRICAL TERMINATION		
22AWG CONDUCTORS IN A SHIELDED CABLE WITH VENT TUBE		
4-20 mA	RED	+ EXCITATION
	BLACK	- EXCITATION
0-5 VDC	RED	+ EXCITATION
	BLACK	- EXCITATION
	WHITE	+ SIGNAL
ALL	DRAIN WIRE	SHIELD



KPSI 700

ORDERING INFORMATION

MODEL		SUBMERSIBLE LEVEL TRANSDUCER	
7	0 0	±1.00% FSO Static Accuracy	
↓	↓ ↓		
MATERIAL			
S Stainless Steel			
T Titanium			
↓			
REFERENCE FORMAT			
1 Vented gage			
3 Sealed gage			
4 Absolute			
↓			
OUTPUT			
3 0-5 VDC			
F 0-2.5 V			
G 0-4 V			
H 0-10 V			
J 1.5-7.5V			
4 4-20mA			
6 4-20mA temperature measurement option			
↓			
PRESSURE CONNECTION			
A Open-face nose cap			
B Ported nose cap			
E Piezometer nose cap			
2 1/4" - 18 NPT male fitting			
7 1/2" - 14 NPT male fitting			
↓			
ELECTRICAL CONNECTION			
0 Molded cable seal			
4 1/2" - 14 NPT male conduit fitting with molded cable seal			
A Gland cable seal			
B 1/2" - 14 NPT male conduit fitting with gland cable seal			
↓			
LIGHTNING PROTECTION			
A None			
B Full Lightning Protection			
↓			
LEVEL RANGE (at MAX output)¹			
#	#	#	#
↓	↓	↓	↓
LEVEL RANGE (at MIN output)¹			
#	#	#	#
↓	↓	↓	↓
MOISTURE PROTECTION			
A None (sealed/absolute only)			
B Vent Filter			
C Aneroid Bellows			
↓			
CABLE TYPE			
1 Polyurethane			
2 ETFE			
↓			
CABLE LENGTH			
#	#	#	#
↓	↓	↓	↓
(in feet)			
LABEL²			
A psi			
B ft H ₂ O			
C m H ₂ O			
↓			
7	0 0		

Notes:

- 1 The part number requires two level range limits, corresponding to the maximum and minimum analog outputs of the transducer, to be specified in **pounds per square inch (psi)** to three decimal places. The lower level range is typically 000.000 unless otherwise required. For reverse output requirements, enter the lower level range for the maximum output signal and the upper range for the minimum output. Use the following conversion factors:

ft H₂O / 2.3073 = psi
m H₂O / 0.703265 = psi

Examples: 10 ft H₂O / 2.3073 = 4.334 psi
10m H₂O / 0.703265 = 14.219 psi

(enter 004.334 in the part number)
(enter 014.219 in the part number)

For sealed gage reference add local atmosphere when converting to psi. Contact MEAS for assistance.

Example: 10 ft H₂O / 2.3073 + 14.7 = 19.034 psi

(enter 019.034 in the part number)

- 2 Units of measure on standard MEAS label. Contact Measurement Specialties if private labeling is required.

NORTH AMERICA

Measurement Specialties, Inc.
1000 Lucas Way
Hampton, VA 23666
USA
Tel: 1-757-766-1500
Fax: 1-757-766-4297
Toll Free: 1-800-745-8008
Sales: WL.sales@meas-spec.com

EUROPE

Measurement Specialties (Europe), Ltd.
26 Rue des Dames
78340 Les Clayes-sous-Bois
France
Tel: +33 (0) 130 79 33 00
Fax: +33 (0) 134 81 03 59
Sales: pfg.cs.emea@meas-spec.com

ASIA

Measurement Specialties (China), Ltd.
No. 26 Langshan Road
Shenzhen High-Tech Park (North)
Nanshan District, Shenzhen 518057
China
Tel: +86 755 3330 5088
Fax: +86 755 3330 5099
Sales: pfg.cs.asia@meas-spec.com

The information in this sheet has been carefully reviewed and is believed to be accurate; however, no responsibility is assumed for inaccuracies. Furthermore, this information does not convey to the purchaser of such devices any license under the patent rights to the manufacturer. Measurement Specialties, Inc. reserves the right to make changes without further notice to any product herein. Measurement Specialties, Inc. makes no warranty, representation or guarantee regarding the suitability of its product for any particular purpose, nor does Measurement Specialties, Inc. assume any liability arising out of the application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Typical parameters can and do vary in different applications. All operating parameters must be validated for each customer application by customer's technical experts. Measurement Specialties, Inc. does not convey any license under its patent rights nor the rights of others.



EPG Companies Inc.
19900 County Road 81
Maple Grove, MN 55311
800-443-7426 * www.epgco.com
Tech Support * 800-762-8418



EPG Companies Inc.
19900 County Road 81
Maple Grove, MN 55311
800-443-7426 * www.epgco.com
Tech Support * 800-762-8418

INDEX

Introduction	2
Connections	3
Run Mode	4
Configuration Procedure	4
Meter Setup Mode	5
Meter Operations Mode	6
Meter Scaling Setup	7
CH1000 Configuration Guide	8
Meter Settings	9

INTRODUCTION

The CH1000 Indicating controller is the heart of the EPG Level Master System. The level is determined by detecting changes in hydrostatic pressure using a submerged stainless steel pressure transducer. The EPG Level Indicating Controller ‘reads’ the corresponding analog current and uses one or two of the three internal relays to turn on and off pumps. Pump control can be either in pump up or pump down modes with either one or two pumps controlled. The relays can also be used as alarms outputs and can be fully configured for failsafe operation.

The feature-rich CH1000 includes optional RS-232/485 Communications Ports, an analog output (a re-transmitted, powered 4-20mA), an internal, 24VDC transmitter power supply and digital inputs (used for pump disable or monitoring pump on/off status & run time). The supply power can be 24VDC, 120VAC or 240VAC. The CH1000’s standard configuration is in inches, but can be field configured to any other units required.

NOTES:

NOTES:

INSTALLATION

1.0 Installation

The power requirements for the meter are listed on the label located on the top of the case. Use only the power indicated. The label also indicates any optional installed hardware that may be installed. The pre-set factory configuration of the meter is also listed. The settings of the meter and the alarms can be changed in the field however prior to unattended operation, it is good practice to confirm all parameters via the display (see configuration guide on page 8).

1-800-762-8418

MODELCH1000-

SN

12VDC		AL1N	AL2N
ANALOG	RS232		RS485

1.1 Mounting

The CH1000 mounts in a standard horizontal 1/8 DIN panel opening. The case mounted “ears” attach to the side of the meter case after it is inserted in the panel. The installation screws supplied with the meter can then be tightened to secure the meter.
DIMENSIONS: Face: 3.75” (95mm) X 1-7/8” (46mm) Depth (back of Panel): 4.5” (114mm) Panel Cutout: 3.5” (90mm) X 1- 11/16” (43 mm).

1.2 Connections

The rear of the meter may have up to three terminal strips. The main 14 terminal strip (J1) is the standard. If options are present then two shorter terminal strips (J2 & J3) will be present and physically located above J1.

J1

1	2	3	4	5	6	7	8	9	10	11	12	13	14
H	N	G	C	K1	K1	K2	K2	K3	K3	+24	S+	S-	C

- 1 - VAC Hot / DC+
2 - VAC Neutral / DC-
3 – Ground
4 – Common
5 – Pump Relay #1
- 6 - Pump Relay # 1
7 – Alarm Relay #1
8 – Alarm Relay #1
9 – Alarm Relay #2
10 – Alarm Relay #2
- 11 - +24VDC @ 100mA
12 – SIGNAL I/P sinking(+)
13 - SIGNAL I/P sinking (-)
14 – Common
SEE NOTES BELOW RE: Inputs

NOTES:
All relays Form A rated 5A @ 120 VAC
Use Terminals 12 (+) and 13 (-) for sinking inputs (i.e. 2 wire transmitters)
Use terminals 13(+) and 14(-) for sourcing inputs (i.e. 4 wire transmitters)
For RS-485 or for quick turn-around RS-232, jumper RTS and CTS.

RUN MODE

2.0 Levels and Alarms

During normal operation the meter will display the real time process level in the units (inches, centimeters etc) in which the level transducer and the CH1000 were calibrated during setup. During normal operation the display indicates the process level. If the meter is in alarm or a pump is on, every 15 seconds the display will toggle to briefly indicate this status (i.e. AlHi, P etc.). Pressing the UP and DOWN arrows simultaneously will cause the METER TYPE to be displayed.

2.1 Min / Max

During normal operation pressing either the UP or DOWN arrows will cause the most recent minimum or maximum process level values recorded by the meter since the last active meter reset. An Active Reset is performed by simultaneously pressing the UP arrow (max reset) or DOWN arrow (Min reset) and the SETUP/ENTER key together.

2.2 LED Indicators

There are three LED's located vertically on the left side of the display that indicate the meter's real time operating status.
The TOP LED flashes in alarm if the communications option board is present and the communication has failed. A small LED to the left of this LED flashes if the option is installed and the meter is communicating.
The MIDDLE LED is non-operational and reserved for future use.
The BOTTOM LED is ON if either a local or remote pump lockout is enabled.

2.3 Real Time Digital Input Status

Press the SETUP/ENTER key momentarily. The display will read ZERO. Enter a Setup Code value of 2 by pressing the UP arrow twice and press the SETUP/ENTER key. The display will show 'd????'. Each '?' will be either a 1 (on) or 0 (off) with each digit representing the status of a local digital inputs. The meter will continue to monitor and control the pumps while this operation is performed.

CONFIGURATION PROCEDURE

The meter when first plugged in will quickly perform a startup routine confirming the operation of all the LED segments. It will then display the current input value. If there is no input and the meter was setup at EPG, (EPG standard configuration is for a 0-5PSIG input with 4-20mA output) the meter will display -34.6. In order to change any set points or internal values, one must enter the respective SETUP MODE as defined in the Setup Guide on page 10 of this manual. To enter a SETUP MODE (25, 35, 45) simply firmly press the SETUP/ENTER key momentarily. Upon release the meter's display will indicate ZERO. Using the UP/DOWN arrow keys, increment this value to the desired entry code (25, 35, or 45) and press the SETUP/ENTER key. The meter will automatically step to the next menu item. The meter will display the next menu item briefly and then either wait for an entry or toggle to show the current value. Use the UP/DOWN keys to set the required value. Pressing the SETUP/ENTER key will enter this value into the meter's internal memory and increment the display to the next menu item.

*** Keyboard inactivity for more than three minutes will cause the meter to exit the setup mode and return to the run mode.**

METER SETTINGS

LevelMaster™ Model CH1000 Meter

Panel S/N: _____

Meter S/N: _____

Meter Designation: _____

Meter Type: _____

Meter Relay 1 Function: _____

Meter Relay 2 Function: _____

Meter Relay 3 Function: _____

Relay 1 Contacts: _____

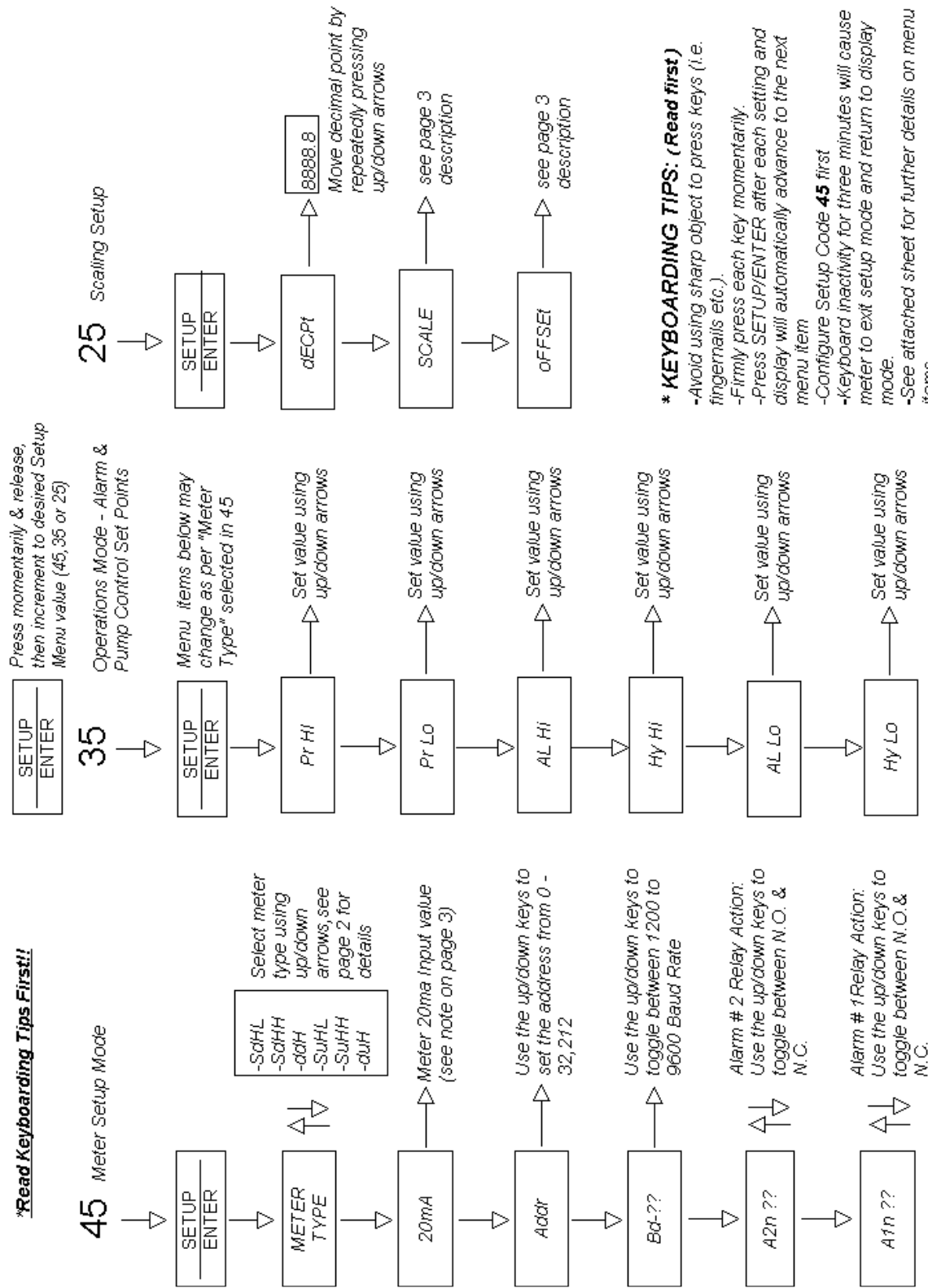
Relay 2 Contacts: _____

Relay 3 Contacts: _____

Operating Parameters –

PARAMETER	UNITS	OPERATION
DECpT	888.8	Sets meter display decimal point.
SCALE	.866	Sets meter scale to read in inches (5 psi pressure transducer).
oFFSE	-34.6	Sets meter display for input = 0 ma (5 psi pressure transducer).
PrHi	_____	Relay 1 (K1) turns on when meter displays = _____
PrLo	_____	Relay 1 (K1) turns off when meter displays = _____
ALHi	_____	Relay 2 (K2) turns on when meter displays = _____
HYHi	_____	Relay 2 (K2) turns off when display drops _____ below R2 Level
ALHi2	_____	Relay 3 (K3) turns on when meter displays = _____
HYHi2	_____	Relay 3 (K3) turns off when display drops _____ below R3 Level

***Read Keyboarding Tips First!!**



CH1000 Configuration Guide

Nov. 2005 Rev-01

METER SETUP MODE (CODE 45 – configure first)

3.0 METER TYPE

The meter can be configured for 6 different pump control actions as follows:

#	CODE	EQUIPMENT	ACTION	ALARM #1	ALARM #2
1	SdHL	Single Pump	Pump Down	Hi	Lo
2	SdHH	Single Pump	Pump Down	Hi	Hi Hi
3	ddH	Dual Pump	Pump Down	Hi	N/A
4	SuHL	Single Pump	Pump Up	Hi	Lo
5	SuHH	Single Pump	Pump Up	Hi	Hi Hi
6	DuH	Dual Pump	PumpUp	Hi	N/A

NOTES:

- Control mode types 1, 2, & 3 may also be referred to as emptying or pump out and modes 4, 5 & 6 may be referred to as filling or pump in.
- The alarm relays are ALL Normally Open (fail safe) and can be field configured as Normally Open or Normally Closed (see 3.4 & 3.5 below).

3.1 20mA CALIBRATION

The meter is delivered from EPG pre-calibrated. Under normal operation this setting should NEVER be adjusted. If re-calibration is required consult your EPG representative.

3.2 MODBUS ADDRESS (Addr = 1- 240)

Use the UP/DOWN arrow keys to enter the desired Modbus address and press the SETUP/ENTER key. This is only active if this option is installed

3.3 MODBUS Serial Baud Rate

The communication transfer rate can be toggled between 1200 Baud (bd-12) and 9600 Baud (bd-96) using the UP/DOWN arrows. This is only active if the option is installed.

3.4 2nd Alarm Contact Configuration (terminals 9 & 10)

Use the UP/DOWN arrows to toggle between Normally Open & Normally Closed relay configuration for relay #2 associated with the second alarm of Single Pump Systems or the high alarm of dual pump system.

3.5 1st Alarm Contact Configuration (terminals 7 & 8)

Use the UP/DOWN arrows to toggle between Normally Open & Normally Closed relay configuration for the relay associated with the first alarm of a single pump system or the second pump control relay of a dual pump system.

METER OPERATIONS MODE (CODE 35 – sets alarm & pump control points)

4.0 Menu Items Overview (described below) for METER TYPE

Step #	SdHL	SdHH	ddH	SuHL	Suhh	duH
1	PrHi	PrHi	PrHi	PrHi	PrHi	PrHi
2	PrLo	PrLo	PrLo	PrLo	PrLo	PrLo
3	AIHi	AIHi	PrHi2	AIHi	AIHi	PrHi2
4	HyHi	HyHi	PrLo2	HyHi	HyHi	PrLo2
5	AILo	AIHi2	AIHi	AILo	AIHi2	AIHi
6	HyLo	HyHi2	HyHi	HyLo	HyHi2	HyHi

4.1 PrHi (Relay #1 – terminal strip J1 #5 & 6)
This is the upper on or off set point for the main pump control and is adjusted using the UP/DOWN arrow keys.

4.2 PrLo
This is the lower set point for the main pump control and is adjusted using the UP/DOWN arrow keys.

4.3a AIHi (Relay#2 – terminal strip J1 #7 & 8)
Use the UP/DOWN arrow keys to adjust the Hi Alarm. **OR**
4.3b PrHi2

This is the upper on or off set point for the secondary pump in a lead/lag control situation. It is adjusted using the UP/DOWN arrow keys.

4.4a HyHi
The High alarm hysteresis determines the value by which the process must deviate from the alarm set point before the relay returns to its normal state.
OR

4.4b PrLo2
This is the lower on or off setpoint for the secondary pump control and is adjusted using the UP/DOWN arrow keys.

4.5a AILo (Relay#3 – terminal strip J1 #9 & 10)
Use the UP/DOWN arrow keys to set a lower alarm limit for a single pump system.
OR

4.5b AIHi2 / AIHi
Use the UP/DOWN arrow keys to adjust the Hi/Hi or Hi Alarm for single or dual pump systems. 4.6
HyLo or HyHi (Same as 4.4a above)

METER SCALING SETUP (Setup Code 25 - scales display)

5.0 DECIMAL POINT

Using the UP / DOWN arrow keys the decimal point can be moved to the left or the right providing the resolution required for the application.
NOTE: Moving the decimal point to the far right will cause it to be “hidden”.

5.1 SCALING FACTOR

It is necessary to cause the display counts (0-2000) to read in actual engineering units. . This is done using a Scaling Factor and a Scaling Offset Factor.
Using the factory standard level transducer as an example (0 – 5 PSI two-wire transducer scaled in inches with an output of 4 – 20mA’s) these factors are calculated as follows.

Scaling Factor = Desired Reading Range / Max. Display Count

Therefore: The URL (5 PSIG) converted to inches is 138.55” (5 X 27.71” H2O per 1 PSI)
Because the transducer is “zero based” (0-138.55”) and the current output is “live” (4-20), 25% or (1/4) of the URL value must be added: $138.55 / 4 = 34.64 + 138.55 = 173.19$ or ~173.2

Remove the decimal point for calculation: $1732 / 2000 = .866$ >> **The scaling factor is: .866**

5.2 SCALING OFFSET

It is now necessary to perform an offset or to suppress the above range to Zero. The factory default for the 0-5 PSIG transducer with a 4-20mA Output is –34.6
The standard equation for doing this is: The negative value of (Suppressed Range (4mA) / Active Range (16mA)) * Desired Units Full Scale

$-(4 / 16) * 138.55 = -34.6$ >> **The offset factor is: -34.6**

TROUBLESHOOTING TIPS

1. Pressing the UP/ DOWN arrows simultaneously will cause the meter to display its current configuration and alarm type.
2. Confirm power to all devices and equipment
3. Check configuration of meter (including decimal point location)

Attachment 11 - Sensaphone Water Sensor

Contact
Series

ZONE WATER DETECTION SENSOR



Widespread water detection

The Sensaphone zone water detector is for use in detecting the presence of water on a floor or in a false ceiling. It comes with 10' of WaterRope cable of covering a larger area than the FGD-0013 water sensor. Up to ten WaterRopes can be cascaded from a single sensor for even greater coverage. Works with all Sensaphone products and operates on two AA batteries.

TECH SPECS

Name	Zone Water Detection Sensor
Connection	Hardwired
Housing	Plastic
Dimensions	5.5 x 3.3 x 1.4" 140 x 83 x 33mm
Sensor Series	Contact Series
Notes	Up to 10 water ropes can be cascaded from a single sensor

All specifications subject to change without notice

Product Name

Part Number

Contact Type Zone Water Detection Sensor	FGD-0056
Water Rope Extension for Zone Water Detection Sensors	FGD-0063



Family owned and made in the USA since 1985

901 Tryens Road

Phone: 877-373-2700

Aston, PA 19301

Web: sensaphone.com



Attachment 12 - Pump Motor Starter Specifications

NEMA Freedom Line Enclosed Control

ECN0501AAA-R63/B

UPC: 786685450377

Dimensions: 14.9 IN * 10.1 IN * 8.5 IN (L * W * H)

Notes: No Data

Warranty: 1 year

Specifications:

- **Coil Voltage:** 110V/50 Hz-120V/60 Hz
- **Enclosure:** NEMA 1
- **Type:** Non-combination non-reversing starter
- **Size:** NEMA size 0
- **Overload Relay:** 1-5A solid-state relay without ground fault
- **Phase:** Single-phase

Supporting documents:

- [Eatons Volume 10-Enclosed Control](#)
- [Eaton Specification Sheet - ECN0501AAA-R63/B](#)

Certifications:

- UL Listed file E1491

Product compliance: No Data



Attachment 13 - EPG Operations and Maintenance Manual

Operator Control Station – Quick Start Guide

The OCS will turn on as soon as it has power. It takes approximately 30 seconds to boot up and will then be running in normal operation. Follow the steps below to access/check/modify all the settings of the Operator Control Station.

1. Press the “**Settings**” button in the lower left. Press “Enter Passcode Here”, and type 2613, then “Enter”. This passcode is needed anytime settings are accessed. For reference, this is the last four digits of EPG’s phone number (763-424-2613).
2. You are now at the Main Settings screen, showing all categories of settings. (Pressing “Back” from the following screens will return you here.)
3. Press “**Level Settings**”. You are now at the Level Settings Screen. From here you can set the Offset and Fullscale of your level sensor (e.g. for a 0-5psi level sensor: Offset is -34.6”, Fullscale is 138.4”). You can also set the levels at which the pump will turn on and off. Finally, you can set the levels at which any included alarms will turn on and off. Typically, a one inch hysteresis is recommended (e.g. High Alarm On Level: 50”, High Alarm Off Level: 49”). This eliminates rapid cycling of an alarm if the liquid level is very close to the alarm level.
4. Press “**Flow Settings**”. You are now at the Flow Settings screen. Depending on the type of signal your flowmeter uses, you will be able to set the Full Flow (4-20ma), R-Scaler (Pulse), or you’ll have no setting if your flowmeter is sending the flow reading directly to the OCS via Modbus. You can also clear the totalizer from this menu (unless your flowmeter is directly controlling the totalizing).
5. Press “**Resets**”. You are now at the Resets screen. From here you can reset your Elapsed Time Meter and/or Cycle Counter. These keep track of the amount of time the pump has run and the number of times it has started, respectively.
6. Press “**Modbus**” (if included). You are now at the Modbus Settings screen. From here you can set the Modbus address.
7. Press “**Data Logging**” (if included). You are now at the Data Logging Settings screen. From here you can set how much time passes between each data point in minutes. You can also start a new log file and/or a new daily log file.
IMPORTANT: *The first time you start up the OCS, make sure you set a logging interval greater than zero, and press “Start New Log File” and “Start New Daily File”. This will initiate the data logging functionality. More in-depth data logging information can be found on the following page.*

Data Logging with the EPG Operator Control Station (OCS), if equipped:

Instructions for Setting up the Data Logging Functionality:

1. During normal operation of the OCS (screens changing automatically every five seconds), press the “Settings” soft button in the lower left corner of the screen.
2. Press “Enter Passcode” and type the default EPG passcode “2613” (last 4 digits of our phone number 763-424-2613), then press “Enter”.
3. Select “Data Log Settings” from the main settings screen, and then select “Log Interval (mins)”.
4. Type in the desired interval (in minutes) between data points, and press “Enter”.
5. The interval will be displayed, and logging will begin automatically. To stop logging, set the interval to “0”.
6. To delete the current log file and start fresh, select either “Start New Log File” or “Start New Daily File”, and then confirm your decision by pressing “YES” on the following screen.

Instructions for Collecting Logged Data:

Note: Data is logged to the MicroSD card inserted in the OCS itself, and then copied to the external USB flash drive. Therefore, the MicroSD card must never be taken out of the OCS, or the data logging function will be unable to log data.

1. Remove the small USB Flash Drive to the right of the OCS.
2. Insert the USB Flash Drive into any PC.
3. View the contents of the USB Flash Drive, and open the “WRITE.CSV” file with a spreadsheet application (e.g. Microsoft Excel or similar). Open “DAILY.CSV” in the same manner to view the daily logged data (if equipped).
4. Replace the USB Flash Drive in USB slot to the right of the OCS. Because Data is being logged to the MicroSD card, no data points are lost when the USB Flash Drive is away. On the first data point after being reinserted, the USB Flash Drive will be updated with any data logging points that may have occurred while it was away from the panel.

Batch Pumping with the EPG Operator Control Station (OCS), if equipped:

Instructions for Setting up the Batching Functionality:

1. During normal operation of the OCS (screens changing automatically every five seconds), press the “Batching” soft button in the corner of the screen.
2. Set the the number of gallons to batch pump by pressing the “Batch Target” and typing in a number of gallons. Then press “Enter”.
3. Make sure the Batch Total is at zero. If there is a leftover Batch Total from a previous batching operation, clear it by pressing “Clear”.
4. When the “Start” button is pressed, the pump will begin batch pumping. When the batch total reaches the batch target you specified, the pump will automatically shut off.
5. If the pump must be stopped for any reason during the batch pumping operation, simply press the “Stop” button. The Batch Total will hold its place and continue where it left off if the pump is started again.
6. The current flow rate is displayed at all times while on the Batch Pumping screen.
7. When finished, press “Back” to return to normal operation (regular screens changing automatically every five seconds).

NOTE: The Batch Pumping screen does NOT need to be displayed for the batching operation to continue. If the “Back” button is pressed during batch pumping, the batch will continue to pump, and still automatically shut down when the Batch Total reaches the Batch Target.

SMS Alarms with the EPG Operator Control Station (OCS), if equipped:

Instructions for Setting up SMS (Text Message) alarm notifications:

1. During normal operation of the OCS (screens changing automatically every five seconds), press the “Settings” soft button in the lower left corner of the screen.
2. Press “Enter Passcode” and type the default EPG passcode “2613” (last 4 digits of our phone number 763-424-2613), then press “Enter”.
3. Select “SMS Alarm Phone Numbers” from the main settings screen.
4. Four spaces will be displayed for possible phone numbers. To add a phone number, touch on the desired space, type in a 10-digit phone number (including area code), and press “Enter”. Make sure any phone number entered is capable of and willing to receive text messages.
5. When an alarm is triggered, any numbers entered on this screen will automatically get a text message explaining which alarm has occurred.
6. When finished, press “Back” to return to the main settings screen, and press “Back” again to return to normal operation (screens changing automatically every five seconds).

NOTE: EPG Companies Inc is not responsible for costs incurred as a result of text messaging rates charged by cellular service providers

EPG Companies Inc.

Operations & Maintenance Manual

FOR

**GRP Mechanical
Company, Inc.
Solutia Judith Lane**

EPG Job #16-12771

EPG Companies Inc.

Operations and Maintenance Index

GRP Mechanical Company, Inc. – Solutia Judith Lane

EPG Job # 16-12771

Bulletin	1055	List of Equipment
Drawings	11625-0250	LMSA2401 Control Panel Schematics
Drawings	11636-0250	ADSA Control Panel Schematics
Bulletin	8000b	EPG Controllers With Intrinsically Safe Circuit(s) Field Installation Instructions
Bulletin	3580	EPG LevelMaster™ Level Meter Model CHS1000-SDHH Operations & Set Up Instructions
Information	56 Pages	M-Series Mag Meter Model M-2000
Photo	A	Front Panel Layout
Photo	B	Inner Door Layout
Photo	C	Back of Inner Door Layout
Photo	D	Back Panel Layout
Bulletin	0200d	Extended Limited Warranty

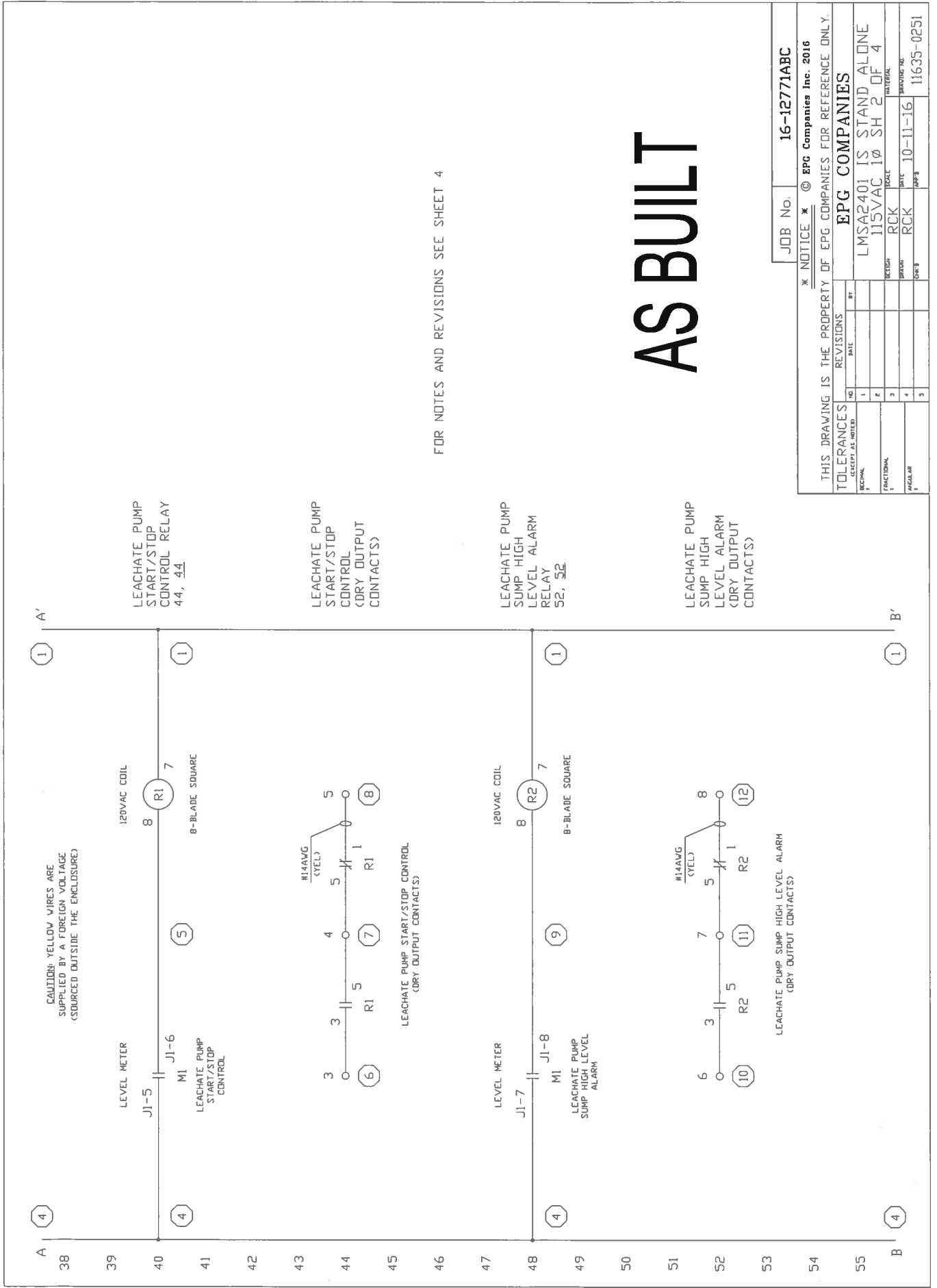
EPG Companies Inc.

List of Equipment

GRP Mechanical Company, Inc. – Solutia Judith Lane

EPG Job # 16-12771

- | | |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 each | LMSA2401
EPG Stand Alone, NEMA 4X non-metallic enclosure, level-IS with pump start/stop relay output, power fail output & high level output. |
| 1 each | ADSA1000
EPG Auto Dialer Stand Alone, NEMA 4X nonmetallic enclosure, with a 8 channel auto dialer. |
| 3 each | 2801054915
Start Winding Control, .5 HP, 230 V, 60Hz, 1PH, 3 wire - quick disconnect |
| 3 each | TSP Transducer Mount
Center mount transducer holder for a TSP 2-8. |
| 3 each | LT05X125P
Submersible Level Sensor, with 125' poly lead, 0-5 PSI, 4-20 mA. |
| 3 each | MAGM20001-1/2
Badger 1-1/2" Model Flanged M-2000,
1-1/2" CS Body 150# Flanged with, PTFE Liner, Alloy C Electrodes, 316SS
Grounding Rings, Remote Amplifier, NEMA 6P Submersible, 30Ft. Cable. (M20-TE-015-F15-S-AC-XX-RS-030-VAC-SGR) |





FIELD WIRING TERMINALS

LEACHATE PUMP LEVEL SENSOR (INTRINSICALLY SAFE TERMINALS)



LEACHATE PUMP CONTROL (DRY OUTPUT CONTACTS)



SUMP HIGH LEVEL ALARM (DRY OUTPUT CONTACTS)



POWER FAILURE (DRY OUTPUT CONTACTS)

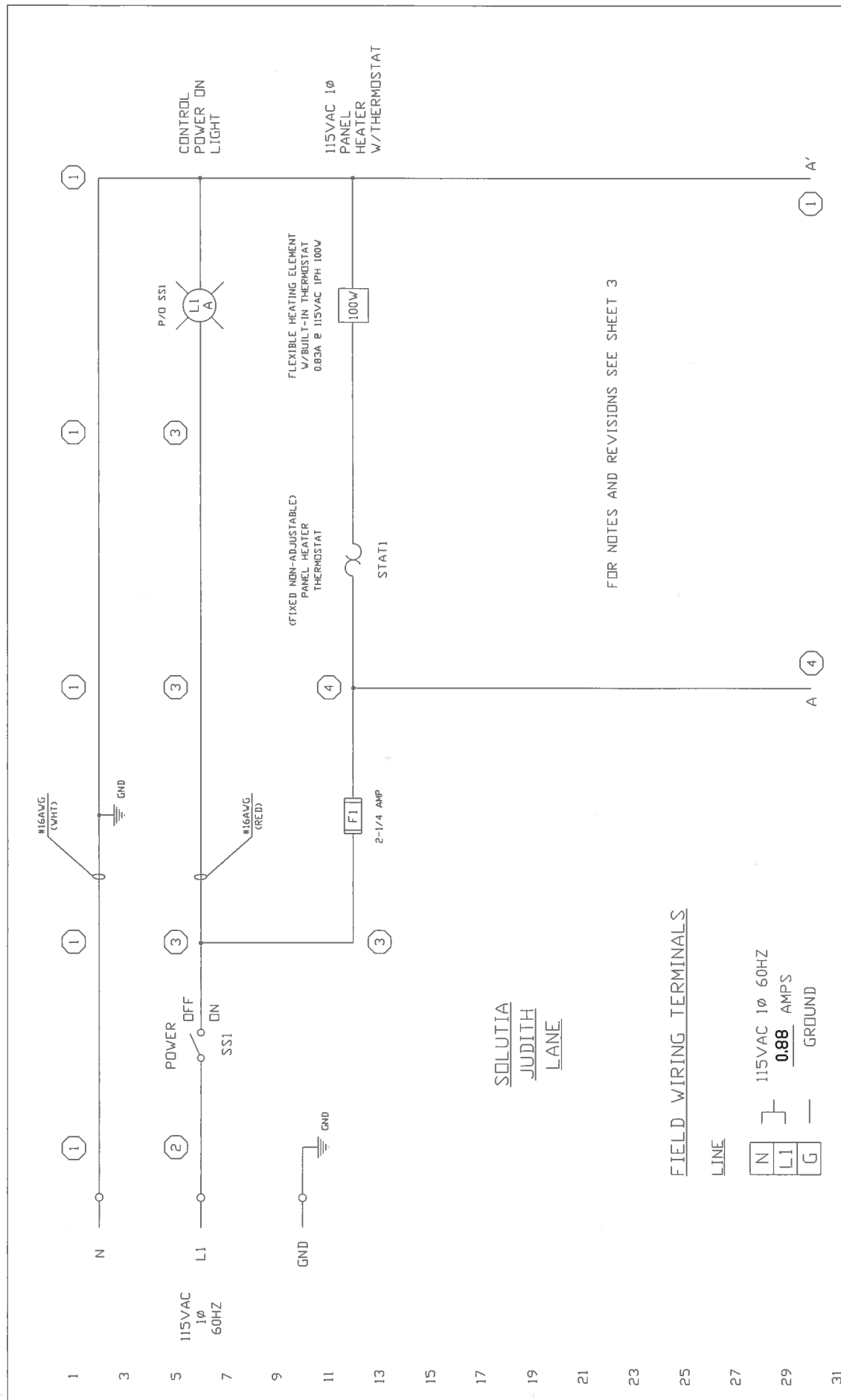


NOTES:

1. NOT PART OF CONTROLLER
2. REFERENCE INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS I HAZARDOUS LOCATIONS, ANSI/ISA-RP 12.6-1987, SECTION 4.5.4
3. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY
4. INSTALL IN ACCORDANCE WITH ARTICLE 504 OF THE NATIONAL ELECTRIC CODE
5. MAXIMUM CABLE LENGTH TO THE LEVEL SENSOR, (MI) IS 3000 FEET

AS BUILT

JOB No.		16-12771ABC	
NOTICE * © EPG Companies Inc. 2016			
THIS DRAWING IS THE PROPERTY OF EPG COMPANIES FOR REFERENCE ONLY.			
TOLERANCES		EPG COMPANIES	
SECTION	REVISIONS	LMSA2401 IS STAND ALONE	
1	DATE	115VAC 1Ø SH 4 OF 4	
2	DATE	RCK	
3	DATE	RCK	
4	DATE	RCK	
5	DATE	RCK	
DRAWING NO.		10-11-16	
DATE		11635-0253	



AS BUILT

FUSE	TYPE	RATING	
F1	MDL	2-1/4	35
F2	MDL	1/4	37

EPC COMPANIES			
ADSA1000	CONTROL	PANEL	
115VAC	1ø	SH 1 OF 3	
FUNCTION	DESCRIPTION	DATE	REVISION
1			
2			
3			
4			
5			

JOB No.	16-12771D
NOTICE	© EPC Companies Inc. 2016
THIS DRAWING IS THE PROPERTY OF EPC COMPANIES FOR REFERENCE ONLY.	
TOLERANCES	
EXCEPT AS NOTED	
NC	DATE
BY	
1	
2	
3	
4	
5	
REVISION	
DATE	
DESCRIPTION	
1	
2	
3	
4	
5	

FIELD WIRING TERMINALS

POWER FAILURE (DRY INPUT CONTACT)



L/N 41

POWER FAILURE (DRY INPUT CONTACT)



L/N 45

POWER FAILURE (DRY INPUT CONTACT)



L/N 49

ALARM (DRY INPUT CONTACT)



L/N 59

ALARM (DRY INPUT CONTACT)



L/N 63

ALARM (DRY INPUT CONTACT)



L/N 67

NOTES:
1. NOT PART OF CONTROLLER

AS BUILT

JOB No.		16-12771D	
NOTICE		EPC Companies Inc. 2010	
THIS DRAWING IS THE PROPERTY OF EPC COMPANIES FOR REFERENCE ONLY.			
TOLERANCES (EXCEPT AS NOTED)		EPC COMPANIES	
REVISED		ADSA1000 CONTROL PANEL	
1		115VAC 1Ø SH 3 OF 3	
2		RCK RCK	
3		SCALE	
4		DATE 10-11-16	
5		DRAWING NO. 11636-0252	

EPG Controllers With Intrinsically Safe Circuit(s)

Field Installation Instructions

PURPOSE: Provide instructions to install EPG control panels with Intrinsically Safe (IS) Circuits wired to EPG Level Sensors, EPG Flow Sensors, and Single and Dual Level Float Sensors.

PROCEDURE:

Familiarize yourself with the electrical components and the panel electrical schematics. Read these instructions thoroughly before attempting installation of intrinsically safe circuits. Reference: Installation of intrinsically safe instrument systems in CLASS I HAZARDOUS LOCATIONS, ANSI/ISA-RP 12.6-1987, SECTION 4.5.4.

Install in accordance with Article 504 of the National Electrical Code.

This control panel and its intrinsically safe circuit(s) must be connected to a ground system with very low impedance (1 OHM or less) per NEC 504-50 and 250-50.

See control panel drawings for device wiring. Only simple apparatus (NEC 504-2) and those specifically called out in the controller drawing are to be connected to the intrinsically safe circuit(s). The attached drawings show specific device wiring for level, flow, single level float and dual level float sensors.

Where intrinsically safe circuits enter or exit a hazardous (classified) area, a means must be provided to prevent the passage of gases or vapors per NEC 501-5. A seal device must be installed to conduit entering the enclosure and then filled with appropriate sealant.

Wiring of intrinsically safe circuits shall be physically separated from non-intrinsically safe circuits per NEC 504. Do not run intrinsically safe and non-intrinsically safe circuits in the same conduit.

Do not exceed maximum cable lengths stated in the control panel drawings.

Field wiring supplied by others is to have 600 Volt insulation rating.

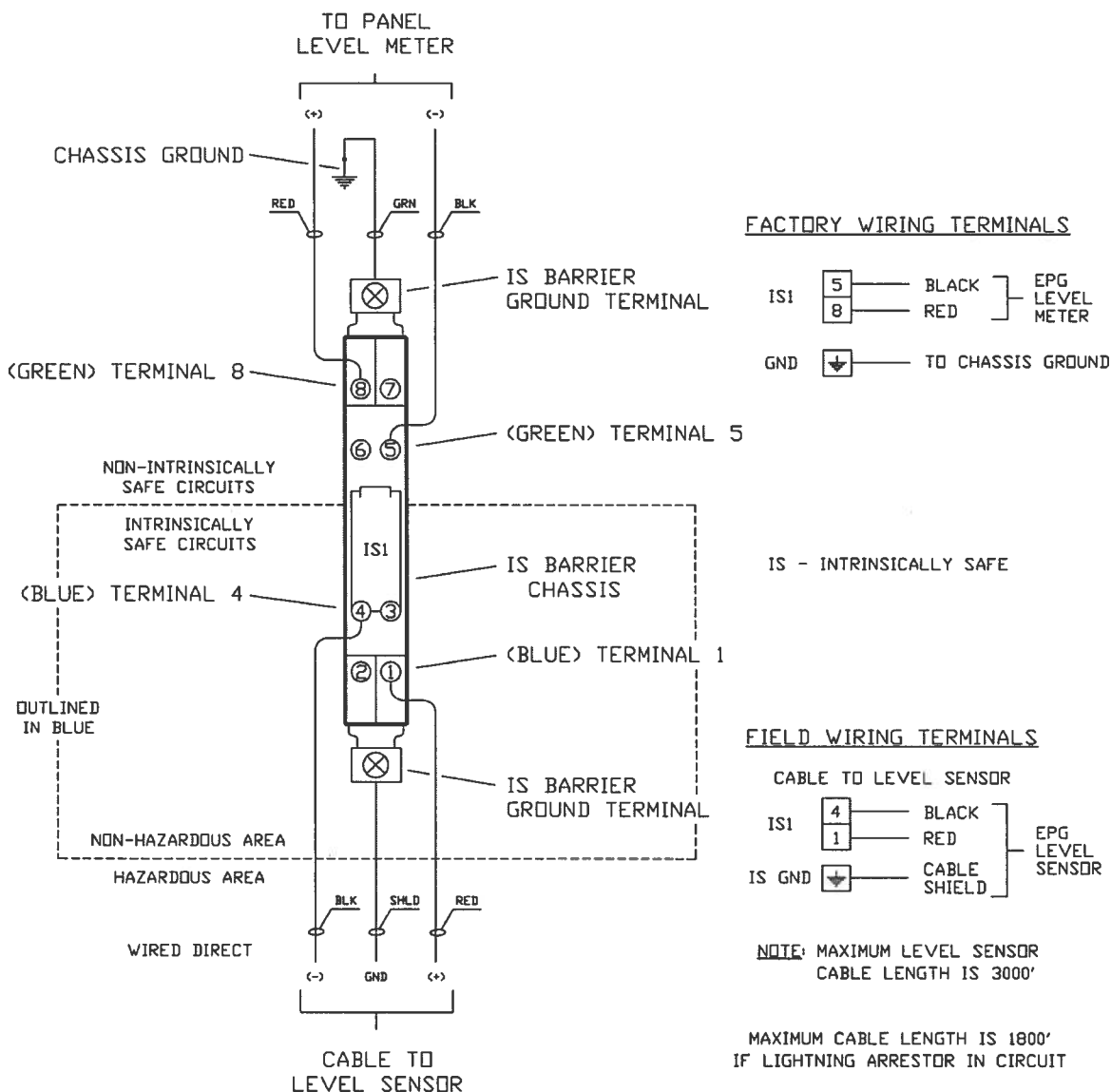
Conductors of intrinsically safe circuits must be separated by at least 5" from conductors of any non-intrinsically safe circuits.

If field wiring is terminated in field supplied junction boxes there must be a minimum of 8" between intrinsically safe and non-intrinsically safe field wiring terminals.

Do not substitute parts. Use only the same make, model, and part number as originally supplied.

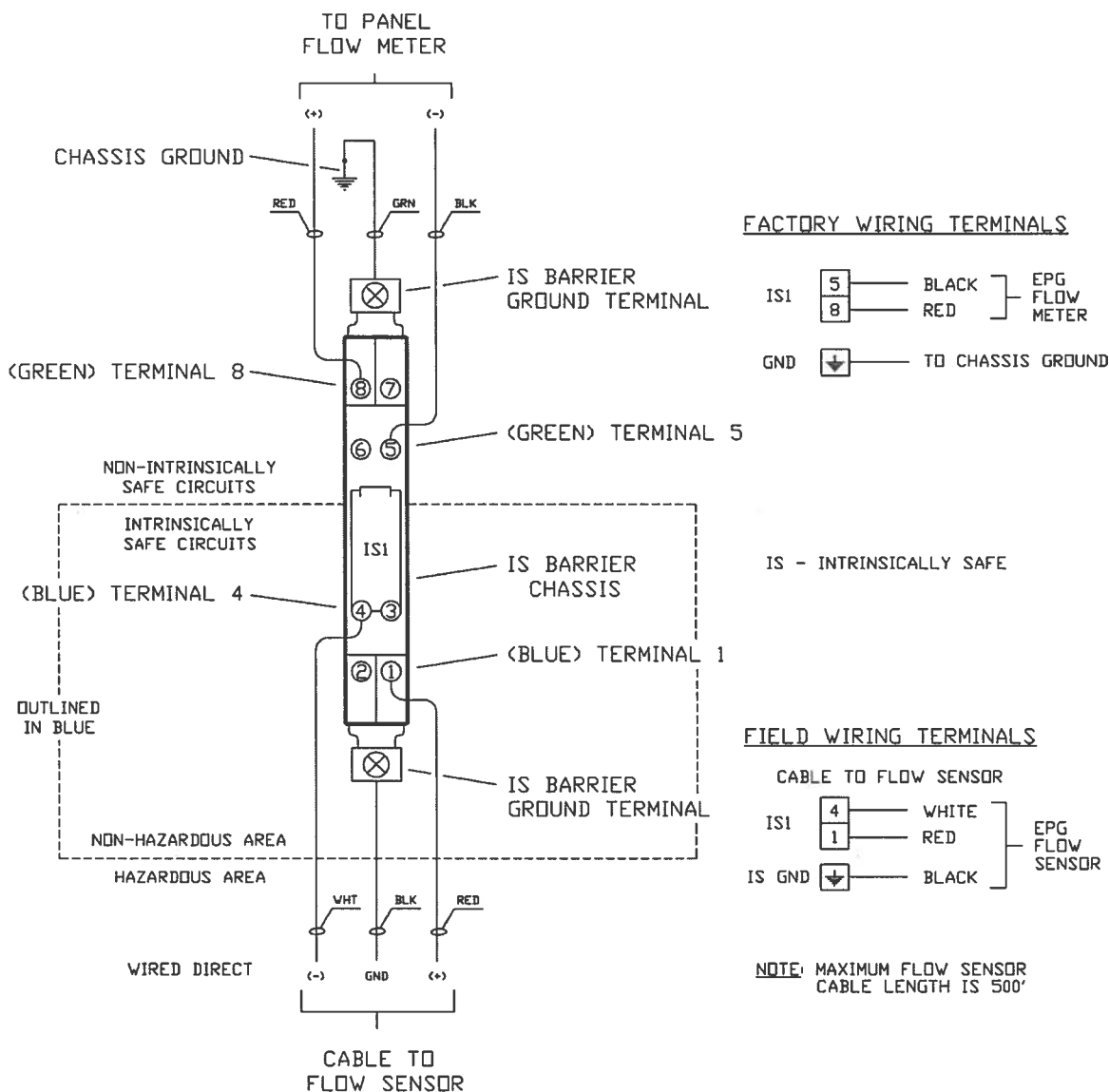
Replace fuses only with fuses of same type and rating.

IS BARRIER - LEVEL SENSOR



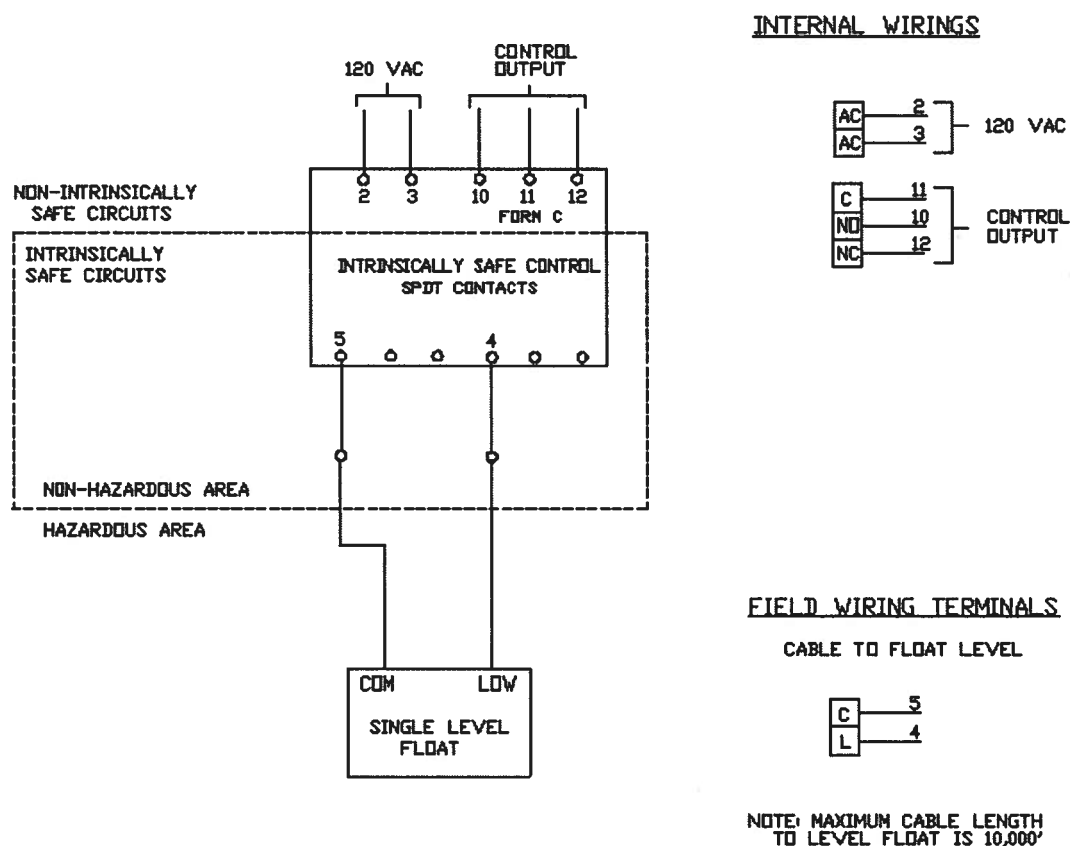
- NOTE: 1. PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS I GROUPS C & D HAZARDOUS LOCATIONS WHEN CONNECTED PER EPG BULLETIN 8000B.
2. REFERENCE INSTALLATION OF INTRINSICALLY SAFE SYSTEMS IN CLASS I HAZARDOUS LOCATIONS, ANSI/ISA-RP 12.6-1987, SECTION 4.5.4.
3. WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
4. INSTALL IN ACCORDANCE WITH ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE.
5. MAXIMUM CABLE LENGTH TO EPG LEVEL SENSOR IS 3000 FEET. MAXIMUM LENGTH IS 1800 FEET IF LIGHTNING ARRESTOR IN LEVEL SENSOR CIRCUIT.

IS BARRIER - FLOW SENSOR



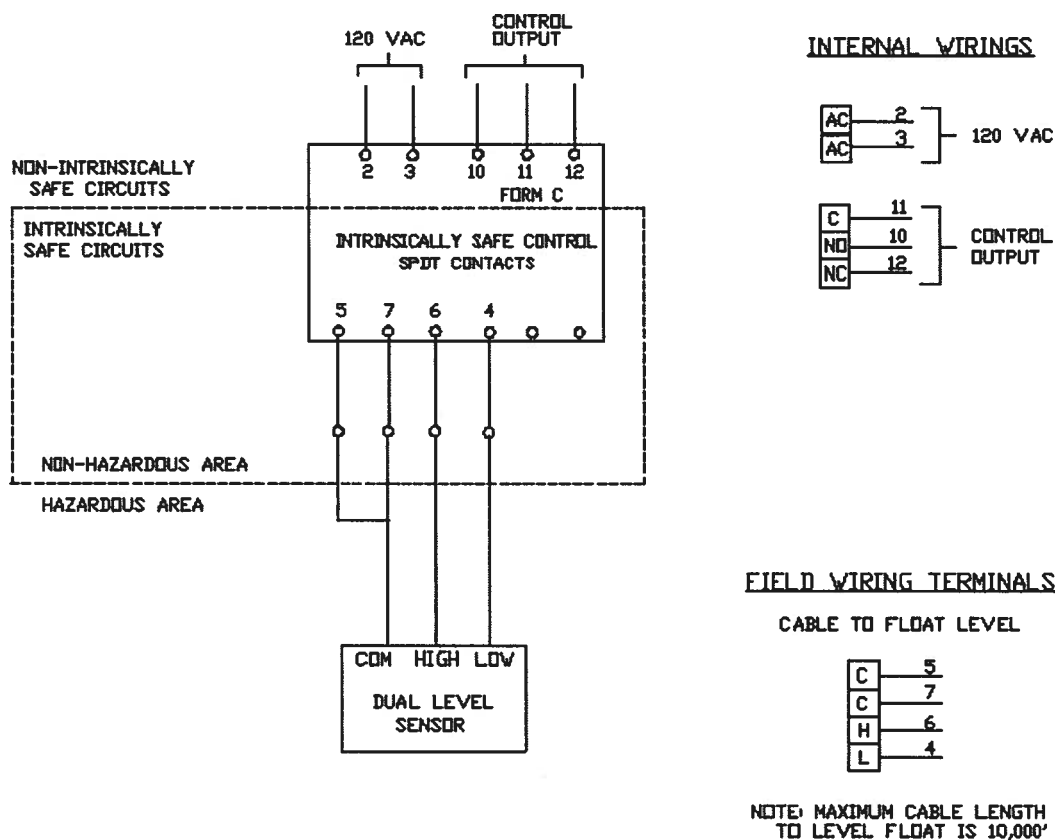
- NOTE: 1. PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS 1 GROUPS C & D HAZARDOUS LOCATIONS WHEN CONNECTED PER EPG BULLETIN 8000B.
2. REFERENCE INSTALLATION OF INTRINSICALLY SAFE SYSTEMS IN CLASS 1 HAZARDOUS LOCATIONS, ANSI/ISA-RP 12.6-1987, SECTION 4.5.4.
3. WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
4. INSTALL IN ACCORDANCE WITH ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE.
5. MAXIMUM CABLE LENGTH TO EPG FLOW SENSOR IS 500 FEET.

I.S. RELAY BARRIER - SINGLE LEVEL



- NOTE: 1. PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS 1 GROUPS A, B, C, & D HAZARDOUS LOCATIONS WHEN CONNECTED PER EPG BULLETIN 8000B
2. REFERENCE INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS 1 HAZARDOUS LOCATIONS, ANSI/NFPA 70
3. WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
4. INSTALL IN ACCORDANCE WITH ARTICLE 504, 2011 OF THE NATIONAL ELECTRICAL CODE
5. MAXIMUM CABLE LENGTH TO LEVEL FLOAT SENSOR IS 10,000 FEET

I.S. RELAY BARRIER - DUAL LEVEL



- NOTE: 1. PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS 1 GROUPS A, B, C, & D HAZARDOUS LOCATIONS WHEN CONNECTED PER EPG BULLETIN 8000B
2. REFERENCE INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS 1 HAZARDOUS LOCATIONS, ANSI/NFPA 70
3. WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
4. INSTALL IN ACCORDANCE WITH ARTICLE 504, 2011 OF THE NATIONAL ELECTRICAL CODE
5. MAXIMUM CABLE LENGTH TO LEVEL FLOAT SENSOR IS 10,000 FEET

EPG LevelMaster™ Level Meter

Model CHS1000-SDHH

OPERATION & SET UP INSTRUCTIONS

The EPG LevelMaster system uses a submersible pressure transmitter to detect changes in fluid levels and a programmable meter featuring a digital LED display and front panel keypad to monitor and control fluid levels. The user can program the desired control parameters for a single pump and one other high level control function. The LevelMaster display is in inches unless otherwise programmed. During a pumping and/or an alarm condition, the display alternates between the message and the current liquid level reading. The message indicates which function is active (see below).

GENERAL SETUP OPERATIONS

IMPORTANT: During setup, if three (3) minutes elapse without a keypad entry the meter automatically returns to the run mode without the entered changes being stored. **DO NOT USE FINGERNAIL OR OTHER SHARP OBJECT TO PROGRAM METER. DAMAGE TO KEYPAD MAY RESULT.**

DISPLAY	INSTRUCTION
SETUP	At this prompt, enter the lockout code (35) in order to enter the set point setup mode.
Pr HI	At this prompt, followed by the current setting, select the Pump Relay High set point. This is the pump ON set point.
Pr Lo	At this prompt, followed by the current setting, select the Pump Relay Low set point. This is the pump OFF set point.
AL HI	At this prompt, followed by the current setting, select the Alarm High Relay set point. This is the high level alarm set point.
Hy HI	At this prompt, followed by the current setting, select the hysteresis for the Alarm High Relay set point. This value, when subtracted from the high level alarm set point, sets the shut off point for the high level alarm .
AL H2	At this prompt, followed by the current setting, select the Alarm High-High Relay set point. This is the high-high alarm level set point and is factory set.
Hy H2	At this prompt, followed by the current setting, select the hysteresis for the Alarm High-High Relay set point. This value, when subtracted from the high-high level alarm set point, sets the shut off point for the high-high level alarm and is factory set.

DISPLAY	MESSAGE
P	Pump activated. "P" and the current level reading will alternate on the display.
HiP	High alarm & pump activated. "HiP" and the current level reading will alternate on the display.
HiPH2	High-High alarm & pump deactivated. "HiPH2" and the current level reading will alternate on the display.

SET UP PROCEDURES FOR SIMPLEX OPERATION – SDHH METER

STEP NO.	ACTION
1	Push SETUP/ENTER button. Wait for the meter to display 0.
2	Push arrow buttons to set a value of 35 on meter display. Push SETUP/ENTER.
3	Meter shows Pr HI (pump ON set point) followed by current value.
4	Push arrow buttons to set the desired level for pump ON. Push SETUP/ENTER button.
5	Meter shows Pr Lo (pump OFF set point) followed by current value.
6	Push arrow buttons to set the desired pump OFF level. Push SETUP/ENTER button.
7	Meter shows AL Hi (High Level Alarm) followed by current value.
8	Press arrow buttons to set desired high level alarm point. Push SETUP/ENTER button.
9	Meter shows Hy Hi . Press arrow buttons to select how far below the high level point the alarm will shut off. Push SETUP/ENTER button.
10	Meter shows AL H2 (High-High level alarm set point) followed by current value. Factory setting is 150.0". NOTE: This fail safe feature shuts off the pump if the level sensor fails and <u>should not be changed in the field.</u>
11	Meter shows Hy H2 . Press arrow buttons to select value of 0.0". Not used.
12	Push SETUP/ENTER button. Meter returns to normal operation.

EXAMPLE:

If the desired levels for the pump were:

Pump ON	18.0"
Pump OFF	12.0"
High Level Alarm	30.0"
High Level Alarm Hys.	1.0"

Complete steps 1 – 3 above.

Select **18.0** with arrow buttons for the **Pr HI** value. Push SETUP/ENTER.

Pr Lo is displayed, select **12.0** with the arrow buttons for the Pump OFF value. Push SETUP/ENTER.

AL Hi is displayed, select **30.0** with the arrow buttons for the High Alarm value. Push SETUP/ENTER.

Hy Hi is displayed, select **1.0** with the arrow buttons for the High Level Alarm OFF value (value determined by subtracting from high-level-alarm set-point). Push SETUP/ENTER.

INSTALLATION NOTES AND TROUBLESHOOTING

BACKGROUND: Numerous installations of the EPG LevelMaster system have proven its long-term reliability. The majority of malfunctions of the LevelMaster system are the result of improper installation and handling of the pressure transmitter sensor. During new installations, be certain to check for any shipping damage, loose controller connections or parts that may have come loose during shipment.

CAUTION

Do not use any other programming codes other than setup code (35).

SYMPTOM / DISPLAY	PROBABLE CAUSES	HOW TO CORRECT
Continuous above full scale reading (above 139"), or Continuous reading.	If pump has been off for a long period of time, liquid level may actually be quite high. Loose connections in circuit. Short circuit in sensor lead wire or connector or circuit. Faulty sensor.	Reprogram meter if above 150" or pull pump up slightly to initiate pump start. Repair connections in controller. Inspect for shorted connections at breakout box (junction box) and at controller. If connections are good, replace sensor. Replace sensor.
-34.6 reading.	Lead wire damaged or reversed connections. Open circuit in sensor lead wire or controller connections. Faulty power supply in meter.	Check schematic, repair connections. Replace sensor and lead wire. Test IS barrier and meter with simulator. Replace meter.
Erratic readings.	Damaged sensor lead wire. Improper connections. Faulty meter.	Check schematic, repair connections. Replace sensor and lead wire. Test meter with simulator. If faulty meter, replace meter.

Pump starts at normal reading, runs for a few seconds and stops.	Low liquid recovery rate. Screen on pump may be clogged.	Remove pump and clean screen. May also need to disassemble pump and clean pump impellers.
	Sump clogged or plugged.	Remove pump and clean out sump.

FACTORY SETTINGS

LevelMaster Model SDHH Meter

Panel S/N: _____

Meter S/N: _____

Meter Designation: _____

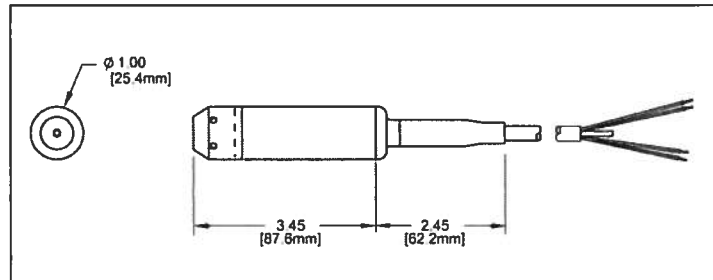
Operating Parameters – Setup Code 35

PARAMETER	VALUE	OPERATION
Pr HI	inches	Turns Pump ON when level on meter reads ____
Pr Lo	"	Turns Pump OFF when level on meter reads ____
AL Hi	"	Turns High Level Light ON when level on meter reads ____
Hy Hi	"	Keeps High Level Light ON until level drops ____ below AL Hi
AL H2	"	Turns Pump OFF when level meter reads <u>150.0</u> Greater indicates a probable level sensor failure.
Hy H2	0.0	Not used

NOTE: If the up arrow is pressed any time that the meter is operating, the highest level that the meter has observed since power was applied will be displayed.

ENGINEER'S SPECIFICATION

EPG LevelMaster™ LT Submersible Level Sensor



GENERAL FEATURES

- * **Application:** The LevelMaster sensor is designed specifically to work with the EPG SurePump™, but its durability, accuracy and weight make it the logical choice for stand alone level applications. The chemical resistant jacketed cable with water block contains a vent tube for atmospheric pressure compensation.
- * **Ranges Available:** 0-28" through 0-690' models are standard. Call EPG for other available ranges.
- * **Accuracy:** The LevelMaster sensor has built-in temperature compensation as well as precise calibration giving an accuracy of $\pm 0.25\%$ at ambient temperature and a combined repeatability and hysteresis error of $\pm 0.10\%$.
- * **Fully Submersible:** The LevelMaster sensor is fully submersible in any liquid compatible with 316 stainless steel and the chemical resistant polyurethane cable jacket. It is designed for submergence at depths greater than 1.5X operating level without sustaining damage. Call EPG for more severe service.
- * **Superior Noise Immunity:** Designed for heavy duty use in hostile environments, the LevelMaster sensor gives outstanding noise immunity. Unlike transducers, whose signals may be distorted by outside interference, the LevelMaster sensor utilizes a conditioned compensated 4-20 mA output to maximize signal strength and accuracy. The sensor also features a shielded lead to help prevent signal disruption from outside sources.

PERFORMANCE

- * **Depth Range:** 0-28" thru 0-690' (0-1 PSI thru 0-300 PSI)
- * **Static Accuracy:** $\pm 0.25\%$ FSO
- * **Thermal Error:** 0.10% FSO/°C
- * **Resolution:** $\pm 0.0001\%$ FS

ELECTRICAL

- * Excitation: 9 to 28 VDC, Red = (+) excitation, Black = (-) excitation
- * Input Current: 20 mA maximum
- * Output: 4-20 mA (2 wire)
- * Zero offset (max): 4-20 mA, ± 0.25 mA
- * Output impedance: <10 ohms
- * Insulation resistance: 100 megohms at 50VDC
- * Circuit protection: Polarity, surge & shorted output
- * Power supply rejection: $\leq \pm 0.05\%$ FSO/VDC (mA output)
- * Electrical termination: 2-22 AWG conductors in a shielded cable with sensor breather and polyurethane jacket

ENVIRONMENTAL

- * Compensated temp range: 0° to 50°C
- * Operating temp range: -20° to 60°C

PHYSICAL

- * Dimensions: Nominal diameter of 1.0" X 5.9" length
- * Weight: 7 oz. (not including cable)
- * Cable: Polyurethane jacketed shielded cable with polyethylene vent tube and Kevlar tension members (.05 lbs/ft)
- * Wetted materials: 316 SS, Viton
- * Mounting provision: Suspended by cable

MODEL {Call EPG for other ranges available – specify length (---)}

PART #	DESCRIPTION	RANGE
LT01X---	Submersible Pressure Transmitter	0-2.3'
LT03X---	" " "	0-6.9'
LT05X---	" " "	0-11'
LT07X---	" " "	0-16'
LT10X---	" " "	0-23'
LT15X---	" " "	0-34'
LT30X---	" " "	0-69'
LT50X---	" " "	0-115'
LT100X---	" " "	0-230'
LT300X---	" " "	0-692'



M-Series® Mag Meter
Model M-2000



IMPORTANT:
This manual contains important information.
READ AND KEEP FOR REFERENCE.

CONTENTS

Safety Precautions and Instructions.....5

System Description.....5

Unpacking and Inspection.....6

Rigging, Lifting and Moving Large Units6

Meter Location, Orientation and Applications8

Remote Amplifier Outdoor Location8

Pipelines and Fluid Flow8

Meter Orientation8

Vertical Placement9

Horizontal Placement9

Straight Pipe Requirements10

Pipe Reducer Requirements.....10

Chemical Injection Applications.....11

Partially-Filled Pipe Situations11

Meter Gaskets and Grounding13

Meter/Pipeline Connection Gaskets.....13

Meter Grounding13

Conductive Pipe Grounding.....13

Non-Conductive Pipe Grounding14

Amplifier Mounting Configuration Options.....14

Meter Mount Configuration14

Remote Mount Configuration14

Submersible Option.....14

Wiring15

Wiring Safety.....15



Opening the M-2000 Cover15

Power Connections16

External Disconnect	16
AC Power Wiring	16
Remote Mount Installation	16
Mount Bracket to Amplifier	16
Wiring Configuration	16
Wiring for Remote Configuration	17
Empty Pipe Detection Considerations	17
Configuring Input/Output (I/O)	18
Analog Output Wiring Diagram	19
Digital Output Wiring Diagrams	20
Digital Input Wiring Diagram	20
Programming the M-2000	21
Displays	21
Menu Selection Display	21
Numeric Entry Display	21
Function Buttons	22
Security	24
Setting the Administration PIN	24
Setting the Service PIN	24
Setting the User PIN	24
Entering Your Personal Identification Number (PIN)	25
Setting Up the M-2000 with Quick Setup	26
Using the M-2000's Main Menu Programming Options	28
Maintenance	50
Cleaning the Flow Tube and Electrode	50
Replacing the Fuse	50
Troubleshooting	51
Appendix: Detector Specifications	53
Appendix: Amplifier Specifications	54

Safety Precautions and Instructions

Some procedures in this manual require special safety considerations. In such cases, the text is emphasized with the following symbols:

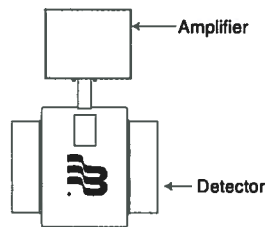
Symbol	Explanation
	Warning indicates the potential for severe personal injury, death or substantial property damage. Comply with the instructions and proceed with care.
	Caution indicates the potential for minor personal injury or property damage. Comply with the instructions and proceed with care.

System Description

The Badger Meter M-Series® model M-2000 electromagnetic flow meter is intended for fluid metering in most industries including water, wastewater, food and beverage, pharmaceutical and chemical.

The basic components of an electromagnetic flow meter are:

- The **detector**, which includes the flow tube, isolating liner and measuring electrodes.
- The **amplifier**, which is the electronic device responsible for the signal processing, flow calculation, display and output signals.



The construction materials of the wetted parts (liner and electrodes) should be appropriate for the specifications on the intended type of service. We recommend that you review all of the compatibilities consistent with the specifications.

Each meter is factory tested and calibrated. A calibration certificate is included with each meter.

Unpacking and Inspection

Follow these guidelines when unpacking the M-Series equipment.

- If a shipping container shows any sign of damage, have the shipper present when you unpack the meter.
- Follow all unpacking, lifting and moving instructions associated with the shipping container.
- Open the container and remove all packing materials. Store the shipping container and packing materials in the event the unit needs to be shipped for service.
- Verify that the shipment matches the packing list and your order form.
- Inspect the meter for any signs of shipping damage, scratches, or loose or broken parts.

Note: If the unit was damaged in transit, it is your responsibility to request an inspection report from the carrier within 48 hours. You must then file a claim with the carrier and contact Badger Meter for appropriate repairs or replacement.

- All detectors with polytetrafluoroethylene (PTFE) liners are shipped with a liner protector on each end to maintain proper form of the PTFE material during shipping and storage.

Note: Do not remove the liner protectors until you are ready to install.

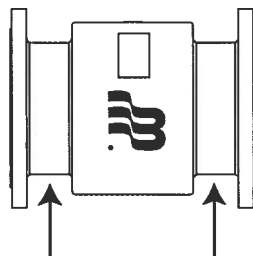
- Storage: If the meter is to be stored, place it in its original container in a dry, sheltered location. Storage temperature ranges are: -40°F to 160°F (-40°C to 70°C).

Rigging, Lifting and Moving Large Units

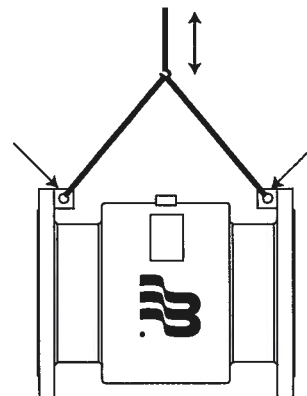
⚠CAUTION

When rigging, lifting or moving large units, follow these guidelines:

- DO NOT lift or move a meter by its amplifier, junction box or cables.
- Use a crane rigged with soft straps to lift and move meters with flow tubes that are between two inches and eight inches (50 mm and 200 mm). Place the straps around the detector body, between the flanges, on each side of the detector.
- Use the lifting lugs when lifting meter flow tubes that are 10 inches (250 mm) in diameter or larger.

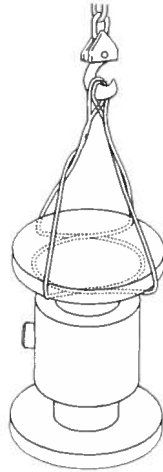


Place straps between flanges.

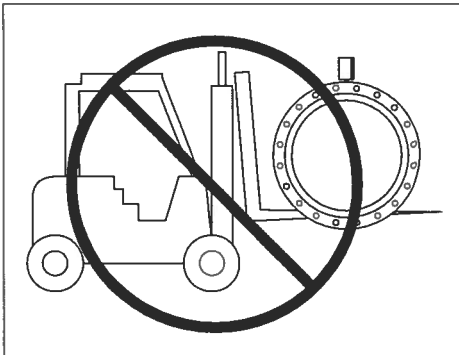


Use lifting lugs with 10-inch or larger meters.

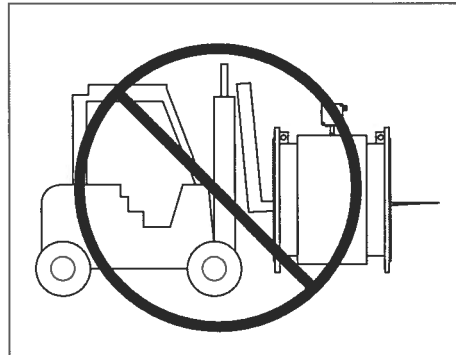
- Use the sling-rigged method to lift large detectors into a vertical position while they are still crated. Use this method to position large detectors vertically into pipelines.



- Do not lift a detector with a forklift by positioning the detector body on the forks, with the flanges extending beyond the lift. This could dent the housing or damage the internal coil assemblies.
- Never place forklift forks, rigging chains, straps, slings, hooks or other lifting devices inside or through the detector's flow tube to hoist the unit. This could damage the isolating liner.



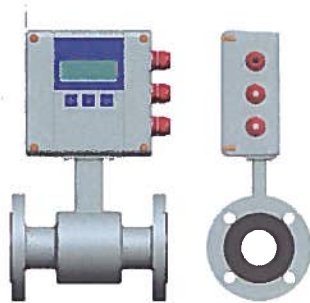
Do not lift detector with forklift.



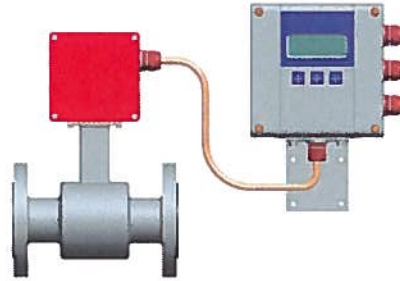
Do not lift or rig lifting devices through detector.

Meter Location, Orientation and Applications

The M-2000 provides two amplifier mounting options: an integral or meter mount option and a junction box/remote option.



Meter mount amplifier



Junction box with remote amplifier

Remote Amplifier Outdoor Location

The amplifier can be installed and operated outdoors. However, it must be protected from the elements, as follows:

- The ambient environment/temperature rating for the unit is -4° F to 140° F (-20° C to 60° C).
- If an indoor location is within 500 feet (152 meters) of the detector, consider increasing the cable length and mounting the amplifier indoors.
- At minimum, fabricate a roof or shield over and/or around the amplifier to protect the LCD display screen from direct sunlight.

Pipelines and Fluid Flow

Take the following precautions during installation:

- Do not install the meter on pipes with extreme pipe vibrations. If pipes are vibrating, secure the piping with appropriate pipe supports in front of and behind the meter. If vibrations can't be restrained, mount the amplifier in a remote location.
- Do not install the detector close to pipeline valves, fittings or impediments that can cause flow disturbances.
- For detectors with PTFE liners, do not install the detector on suction sides of pumps.
- Do not install the detector on outlet sides of piston or diaphragm pumps. Pulsating flow can affect meter performance.
- Avoid installing the detector near equipment that produces electrical interference such as electric motors, transformers, variable frequency, power cables, etc.
- Verify that both ends of the signal cables are securely fastened.
- Place power cables and signal cables in separate conduits.
- Place the meter where there is enough access for installation and maintenance tasks.

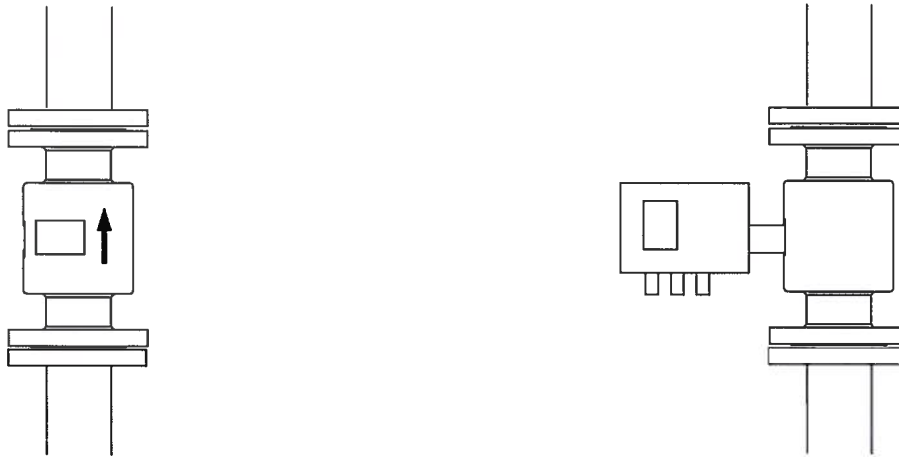
Meter Orientation

Mag meters can operate accurately in any pipeline orientation and can measure volumetric flow in forward and reverse directions.

Note: A "Forward Flow" direction arrow is printed on the detector label.

Vertical Placement

Mag meters perform best when placed vertically, with liquid flowing upward and meter electrodes in a closed, full pipe.



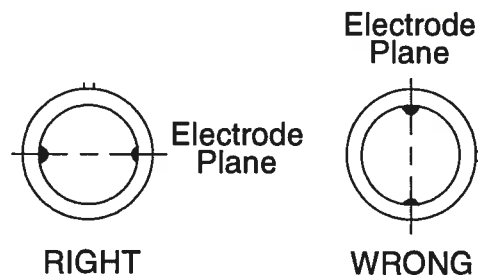
Vertical placement allows the pipe to remain completely full, even in low flow, low pressure applications, and it prevents solids build-up, sediment deposit and accumulation on the liner and electrodes.

Note: Carefully observe the "Forward Flow" label on the meter body and install the meter accordingly. When installed vertically, rotate amplifier so that cable glands are facing down.

Horizontal Placement

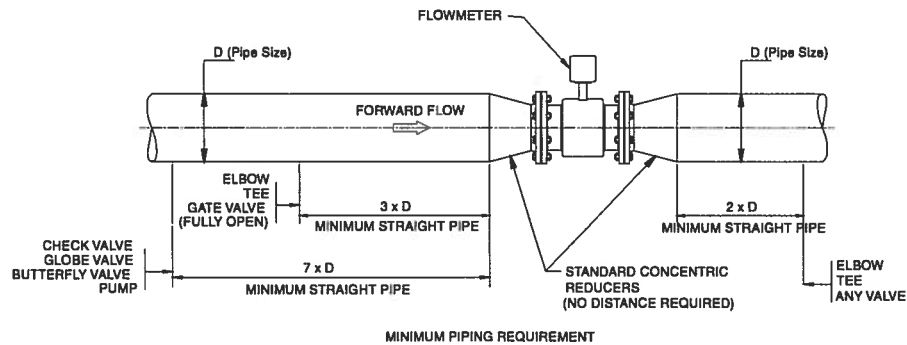
M-2000 meters are equipped with an "Empty Pipe Detection" feature. If an electrode mounted in the pipe is not covered by fluid for five seconds, the meter will display an "Empty Pipe Detection" condition. The meter will send out an error message and stop measuring flow. When the electrode is again covered with fluid, the error message disappears and the meter will begin measuring.

When installing the meter on a horizontal pipe, mount the detector to the pipe with the flow-measuring electrode axis in a horizontal plane (three and nine o'clock). This placement helps prevent solids build-up, sediment deposit and accumulation on the electrodes.



Straight Pipe Requirements

Sufficient straight-pipe runs are required at the detector inlet and outlet for optimum meter accuracy and performance. An equivalent of three diameters of straight pipe is required on the inlet (upstream) side. Two diameters are required on the outlet (downstream) side.

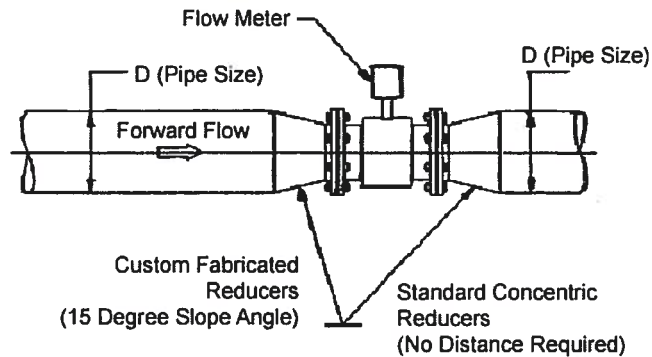


Pipe Reducer Requirements

With pipe reducers, a smaller meter can be mounted in larger pipelines. This arrangement may increase low-flow accuracy.

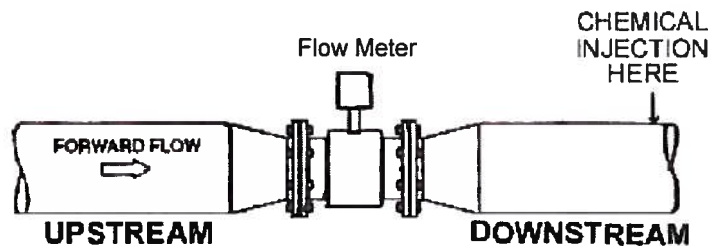
There are no special requirements for standard, concentric, pipe reducers.

Custom fabricated pipe reducers must have an approximate slope angle of 15 degrees to minimize flow disturbances and excessive loss of head. If this is not possible, install the custom pipe reducers as if they were fittings and install the required amount of straight pipe.

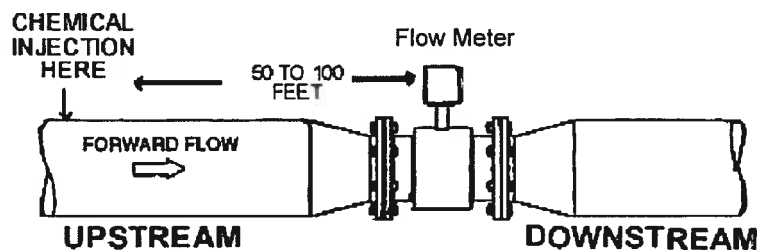


Chemical Injection Applications

For water line applications with a chemical injection point, install the meter upstream of the injection point. This eliminates any meter performance issues.



If a meter must be installed downstream of a chemical injection connection, the distance between the meter and the injection point should be between 50 and 100 feet (15 and 30 meters). The distance must be long enough to allow the water/chemical solution to reach the meter in a complete, homogeneous mixture. If the injection point is too close, the meter senses the two different conductivities for each liquid. This will likely result in inaccurate measurements. The injection method – spaced bursts, continuous stream of drips or liquid or gas – can also affect downstream readings by the meter.



Sometimes, due to circumstances, it's difficult to specify the exact downstream placement distances. Contact Badger Meter Technical Support to review your application if necessary.

Partially-Filled Pipe Situations

In some locations, the process pipe may be momentarily only partially filled. Examples include: lack of back pressure, insufficient line pressure, gravity flow applications, etc.

To eliminate these situations, do not install the meter at the highest point of the pipeline.

